FEB 1 1920

SERIES 3—Vol. 3, No. 1 JANUARY 1920

AMERICAN JOURNAL OF OPHTHALMOLOGY

Incorporating — Established by

THE AMERICAN JOURNAL OF OPHTHALMOLOGY.....Adolf Alt 1884
THE OPHTHALMIC RECORD.....Giles C. Savage 1891
ANNALS of OPHTHALMOLOGY.....James Pleasant Parker 1892
ANALES DE OFTALMOLOGIA.....M. Uribe-Troncoso 1898
OPHTHALMOLOGY.....Harry V. Würdemann 1904
OPHTHALMIC YEAR BOOK AND LITERATURE.....Edward Jackson 1904-11

EDITORIAL STAFF

EDWARD JACKSON, Editor
CLARENCE LOEB, Associate Editor
ADOLPH ALT
CASEY A. WOOD
MEYER WIENER
HARRY V. WÜRDEMANN
H. URIBE-TRONCOSO

COLLABORATORS

FRANK ALLPORT, *Chicago;* HUGO W. AUFMWASSER, *Denver;* HANS BARKAN, *San Francisco;* ARTHUR J. BEDELL, *Albany;* EDMUND E. BLAAUW, *Buffalo;* MELVILLE BLACK, *Denver;* NELSON M. BLACK, *Milwaukee;* FRANK E. BRAWLEY, *Chicago;* W. E. BRUNER, *Cleveland;* BURTON CHANCE, *Philadelphia;* WM. H. CRISP, *Denver;* W. T. DAVIS, *Washington, D. C.;* GEORGE S. DERBY, *Boston;* EDWARD C. ELLETT, *Memphis;* MARCUS FEINGOLD, *New Orleans;* WM. C. FINNOFF, *Denver;* M. W. FREDRICK, *San Francisco;* HAROLD GIFFORD, *Omaha;* HARRY S. GRADLE, *Chicago;* JOHN GREEN, JR., *St. Louis;* D. F. HARBRIDGE, *Phoenix, Ariz.;* WM. F. HARDY, *St. Louis;* GUSTAVUS I. HOGUE, *Milwaukee;* THOMAS B. HOLLOWAY, *Philadelphia;* JOHN A. MCCAW, *Denver;* CHARLES H. MAY, *New York;* WM. R. MURRAY, *Minneapolis;* WALTER R. PARKER, *Detroit;* SAMUEL D. RISLEY, *Philadelphia;* GILES C. SAVAGE, *Nashville;* E. MAYO SCHNEIDEMANN, *Philadelphia;* THEODORE B. SCHNEIDEMANN, *Philadelphia;* GEORGE E. DE SCHWEINITZ, *Philadelphia;* T. H. SHASTID, *Superior, Wis.;* CHARLES P. SMALL, *Chicago;* A. C. SNELL, *Rochester;* GEORGE W. SWIFT, *Seattle;* WILL WALTER, *Chicago;* JOHN E. WEEKS, *New York;* WM. ZENTMAYER, *Philadelphia;* CHARLES ZIMMERMANN, *Milwaukee. Foreign:* SIR JAMES W. BARRETT, *Melbourne, Australia;* MARCEL DANIS, *Brussels, Belgium;* ENRIQUE B. DEMARIA, *Buenos Aires, Argentina;* ROBERT HENRY ELLIOT, *London, England;* J. SANTOS FERNANDEZ *and* F. M. FERNANDEZ, *Havana, Cuba;* J. DE J. GONZALEZ, *Leon, Mexico;* H. J. HOWARD, *Peking, China;* M. LANDOLT, *Paris, France;* J. KOMOTO, *Tokyo, Japan;* ARTHUR F. MACCALLAN, *Cairo, Egypt;* F. P. MAYNARD, *Calcutta, India;* E. E. MONTAÑO, *Mexico City;* SPECIALE CIRINCIONE, *Rome, Italy;* FREDERICK C. TOOKE, *Montreal, Canada.*

Annual Subscription Ten Dollars in Advance,
Single Copies One Dollar.

PUBLISHED MONTHLY BY THE OPHTHALMIC PUBLISHING COMPANY,

7 West Madison Street, Chicago, Illinois.

Entered as Second Class Matter January 1st, 1918, at the Post Office, Chicago, Ill., under the act of March 3rd, 1879.

A Look Ahead

It is with a hopeful feeling of optimism that we extend to our friends our annual greetings at this season.

The year just concluded—the first of the reconstruction period—has been a trying one in many ways. The dearth of all optical supplies following the close of the war created a demand for our products which, in the complexities of readjustment from extensive wartime service, we found it impossible to meet with full satisfaction either to our patrons or ourselves. With government contracts remaining to be filled, the conversion of our enlarged plant to its normal production channels has been of necessity a slow and gradual process.

Today that process has reached the point where we can foresee materially improved conditions in 1920. And so, believing in our ability to direct our greatly increased facilities to your better service during the coming months, we confidently wish you a most happy and prosperous New Year.

BAUSCH & LOMB OPTICAL CO.

St. Paul St., Rochester, N. Y.

NEW YORK CHICAGO SAN FRANCISCO WASHINGTON

Leading American Makers of Photographic Lenses, Microscopes, Projection Apparatus (Balopticons), Ophthalmic Lenses and Instruments, Photomicroscopic Apparatus, Range Finders and Gun Sights for Army and Navy, Searchlight Reflectors, Stereo-Prism Binoculars, Magnifiers and other high-grade Optical Products.

INDEX OF NAMES

Abadie, C. 238, 557, 638, 714, 850, 915.
Abelsdorff, G. 316.
Achard. 640, 785.
Adam, C. 159, 786, 788.
Adams, C. J. 72, 159.
Adams, P. H. 316, 716.
Adams, W. H. 316.
Adamson. 714.
Addison. 476.
Agatston, S. A. 714, 716.
Agnostino, A. 158.
Ahlstrom. 477.
Aitken, C. J. H. 914.
Akazuka. 637.
Alcorta, M. F. 157.
Alexander, G. F. 914.
Alexiades. 911.
Alexowski. 715.
Allan, J. 315.
Allen, E. J. 918.
Allen, F. 557.
Allen, H. G. 395.
Allen, H. S. 317.
Allport, F. 118, 159, 240.
Alonso, A. F. 238, 476, 850.
Alt, A. 626, 635, 778.
Alt, F. 475.
Amman, E. 316, 640.
Amsler, C. 911.
Angelucci, A. 392, 480, 786.
Appleman, L. F. 296, 476.
Arenfeld, T. 474.
Arey, L. B. 78.
Argañaraz, R. 79, 159, 474, 555, 639, 912,
Arnold. 317.
Arnold, J. D. 307.
Arruga. 78.
Arsollier. 917.
Ascher, K. W. 475.
Ashikaga. 637.
Ask, F. 156.
Askey, S. G. 852.
Astor. 479.
Atkinson, D. T. 714.
Aub, J. C. 79.
Aubaret. 315, 318, 393, 476, 913.
Aubineau. 640, 851.
Augstein, C. 316.
Augstein, H. 395.
Aurand. 913.
Aviragnet, Armand-Delville. 912.
Axenfeld, T. 918.
Aynesworth, H. T. 912.

Bab, W. 317, 318, 912.
Bach, F.W. 639.
Bailey, J. H. 77, 394.
Bailliart, P. 238, 316, 638, 476, 557, 851.
Baker, S. J. 918.
Baldino, S. 782, 783.
Bane, W. C. 453, 556, 557, 558, 715, 716.
Bane, W. M. 783.
Banister, J. M. 156, 269, 392, 454, 878, 887, 892.
Barbe, A. 79.
Barber, H. W. 158.
Barbieri, A. 156.
Barlow, R. A. 79.
Bard, L. 316, 477, 715.
Bargy. 912.
Barker, L. F. 240.
Barrada, H. 317.
Barré, J. A. 314, 906.
Barrial, M. R. 911.
Barraquer, I. 394, 714, 721, 770, 914.
Bartolotta, E. 783.
Barrett, J. W. 285, 915.
Baslini, C. 314.
Basterra. 477, 558.
Bates, W. H. 716.
Batten, R. D. 53, 55, 80, 144, 157, 159, 240, 396, 640, 688, 850.
Battestini. 912.
Baudouin. 392.
Baudry, S. 159.
Bauer, C. 79.
Baum, O. 850.
Baumann, C. 316.
Baumm, H. 912.
Baute, H. 557.
Bautzmann, G. 912.
Bayer, F. 850, 911.
Bayle, E. 917.
Bazett, H. 79.
Bazin, G. 318.
Beach, S. J. 911.
Beauvieux. 240, 559.
Beck, C. 159.
Beck, J. C. 349, 475, 560.
Beck, L. K. 393.
Becker. 915.
Beckers, H. 314.
Bedell, A. J. 103, 239, 560, 911.
Behague. 555.
Behmann, A. 914.
Behr. 913.
Behrman, M. 390.
Belcher, G. W. 715.
Bell, G. H. 79, 832.
Bell, L. 78.
Beltrao, T. 395.
Benedict, A. L. 640.
Benedict, M. K. 850, 913.
Benedict, W. L. 78, 79, 244, 395, 571, 784 860, 900.
Benham, E. W. 157.
Bennett, A. G. 78.
Bentzen, C. F. 639.
Berens, C. 170, 319.
Berg. 851, 915.
Berghausen, O. 156.
Bergmeister, R. 239, 475, 715.
Berrisford, P. D. 158.
Berry, G. L. 80.
Bertram, A. J. 558.
Best. 79, 852.
Best, F. 317.
Bestor, H. M. 782.
Bethea, O. W. 845.
Betti, L. 640.
Bettison, D. L. 395.
Bettremieux. 238.
Bevan, A. D. 715.
Bierende, F. 782, 849.

390044

Bilancioni. 314.
Binet, L. 319.
Binnefeld, M. 316.
Birch-Hirschfeld. 78, 915.
Birkhauser, R. 782.
Birley, J. L. 555.
Bjerrum. 780.
Blaauw, E. E. 476, 705, 851.
Black, M. 621, 782, 889, 894, 898, 900.
Black, N. M. 560.
Blair, V. P. 784, 916, 917.
Blake, E. M. 876.
Blanc. 673, 913.
Blanco, T. 841, 914.
Blaxland, F. G. 640.
Blegvad, O. 79, 475.
Blegvad, A. N. R. 558.
Bleisch. 317.
Bliss, E. W. 476.
Bloch, C. E. 783.
Blohmke. 79.
Bluemel, C. S. 477.
Blumenthal, W. 850.
Boegehold, H. 782.
Boenheim, E. 917.
Boez. 395.
Bogardus, F. B. 661, 850.
Böhm. 476.
Bohm, F. M. 913.
Bollack, J. 79, 239, 477, 558, 638, 640, 715, 716, 841, 849.
Bolten, G. C. 315.
Bond, C. J. 479.
Bond, E. D. 319.
Bonnefon, G. 77, 471, 479, 556, 713, 913, 914.
Bonneton. 475.
Bordeaux, L. 363.
Bordes, M. L. Q. 158.
Bordier. 475.
Bordley, J. 851.
Borello, F. P. 393.
Borries, G. V. T. 912.
Botteri. 638.
Bottner. 716.
Boudreau, F. G. 716.
Bourgeois, A. 238, 476, 715.
Bourland. 77.
Bovero, A. 637.
Bowdler, A. P. 319.
Boyd, E. T. 134, 239, 376, 558, 618, 783, 821, 913, 917.
Boyd, W. 319.
Brailey, A. R. 319.
Braisted, W. C. 475, 479.
Bram, I. 559.
Brandes. 366, 559.
Brav, A. 80, 605, 784.
Breaks, L. Z. 711.
Brearley, E. A. 558.
Bresler, J. 853.
Brewerton, E. 475, 906.
Brieux, E. 475.
Brill, E. 639.
Broad, W. H. 319, 476.
Brose, L. D. 158.
Bross, K. 852.
Brown. 394.
Brown, E. J. 156, 668, 850, 884, 893, 898.
Brown, E. V. L. 443, 479, 557.
Browning, S. H. 315, 438, 556.
Brownlie, W. B. 79.
Brückner, A. 556, 854, 914, 917.
Brunetiére. 478, 637, 853.
Buchanan, J. N. 555.
Buley, E. C. 77.
Bulson, A. E., Jr. 138, 240, 357, 476, 918.
Burbage, S. R. 638.
Burckardi, K. 316.
Burdon-Cooper, E. 911.
Burklen. 240.
Burleson, J. H. 52, 160.
Burnett, F. L. 849.
Burnhan, G. H. 805, 917.
Burrowes, A. 716.
Busco, J. 317.
Bussy, G. W. 158, 94.
Bussy, L. 158, 239.
Butler, C. 915.
Butler, T. H. 314, 316, 319, 557, 559, 609, 783, 911.
Buttel-Reepen, H. V. 158.
Buxton, L. H. 157, 393, 556.
Buzzard, E. F. 716.
Byers, W. G. M. 717, 913.
Byrne, J. 638.
Byshowski, Z. 915.
Bywater, E. N. 316.
Bywater, H. H. 638.

Cabannes. 157, 317, 395, 475, 478.
Cadwalader, W. B. 475, 637, 713.
Calderon, V. M. 916.
Calhoun, F. P. 80, 475.
Calhoun, H. A. 159.
Callan, L. W. 48, 154, 158.
Callfass, W. F. 894.
Camerer, B. 915.
Cameron, E. H. 851.
Campbell, C. A. 884.
Campodonico, E. 913.
Campos, E. 318, 477.
Caneja, E. D. 713.
Carnelli, A. F. 714, 917.
Canon. 911.
Cantonnet, A. 156, 237, 315, 316, 320, 392, 475, 477, 555, 637, 639, 913, 914, 915.
Carrayron, A. 478.
Carreras, B. 77, 557.
Carrere, L. 783, 785, 916.
Carruthers, J. F. 53, 159.
Carson, W. E. 59, 156.
Carsten, P. 158.
Carvalho, J. P. 79, 787, 912.
Cary, E. H. 160, 559.
Casolino, L. 853.
Cassan, E. 237.
Cassel. 639.
Cassimatis. 79, 783.
Castaigne, F. 240.
Castelain. 240, 716.
Castellani, A. 478.
Castro, A. F. 157.
Cathala, J. 853.
Cavara, V. 158, 318.
Cecchetto, E. 783.
Ceelen. 395.
Cemach, A. J. 850.
Chacon, A. 77, 390, 475.
Chambers, E. R. 478.
Champlin, H. W. 555.

Chance, B. 241, 380, 394, 558, 827, 828, 913.
Chappé. 637, 850.
Chapusot, C. 479.
Charbonnel, 821.
Charles, J. W. 79, 394, 395.
Charlin. 159.
Charlton, C. F. 802, 916.
Charsley, R. S. 687, 853.
Chase, E. F. 477.
Chase, S. B. 806, 917.
Chattaway, F. D. 314.
Cheinisse, L. 849.
Chenet. 315.
Cheron, A. 240.
Cheval. 915.
Chevalier. 77, 853.
Chevallereau. 395, 559.
Chotzen, T. 395.
Christian, H. A. 559.
Christie, C. D. 79.
Church, B. F. 307.
Cirincione, G. 78.
Claiborne, J. H. 558, 852, 912.
Clapp, C. A. 239, 325, 392, 475, 478.
Clapp, E. W. 160.
Clark, B. 850.
Clark, C. F. 393, 476.
Clark, J. S. 396.
Clarke, E. 314, 318, 319.
Clarke, F. 239, 316.
Clements, E. C. 320.
Climenko, H. 478.
Clopton, M. B. 853.
Clunet, J. 716.
Cobb, B. W. 713.
Cobb, S. 396, 454.
Coblentz, W. W. 159, 394, 558, 715.
Cockcroft, W. L. 556, 638.
Cohen, M. 238.
Cohn, L. 480.
Cohn, P. 78.
Cole, L. J. 477.
Coleman, W. M. 716.
Colin, A. 239, 476.
Collins, E. T. 316, 318, 608, 783.
Colombo, G. 157, 316, 319, 393, 914.
Comby, J. 555.
Comora, A. 394.
Comstock, C. E. 479.
Constentin. 237.
Cooke, T. C. 33, 157.
Cooper, G. M. 479.
Cooper, H. J. 394.
Coover, D. H. 206, 315, 535, 536, 683, 713, 715, 853, 890.
Cope, Z. 395.
Coppez, H. 366, 476 557, 917.
Cordes, F. C. 643, 851.
Cordier. 478.
Cords, R. 853, 912.
Corper, H. J. 238.
Cortes, L. 316.
Coulomb. 149, 480.
Cousin, G. 476, 557.
Coutard. 556.
Cowan, A. 156, 237, 359, 475.
Cowdrick, M. 317.
Cowgill, W. M. 307.
Craig, J. A. 314.
Crawley, F. 317.
Cridland, B. 316.
Crigler, L. W. 558.
Crile, G. W. 916.
Crisp, W. H. 238, 377, 378, 453, 555, 557, 559, 823, 888, 896, 917.
Crocco A. 157.
Crookshank, F. G. 80.
Cross, E. S. 240.
Cross, G. H. 762, 914.
Crossley, E. R. 315.
Crotti, A. 916.
Crouzon, O. 555, 849.
Cruchet. 479.
Cruise, R. R. 55, 158, 318, 319.
Cuenod, A. 637, 913.
Cunningham, J. F. 318.
Curioni, M. 716.
Curran, E. J. 476, 557, 638, 914.
Cushing, H. 715, 912.
Cutler, C. W. 394, 639.

Dabney, S. G. 395, 637.
D'Albe, E. E. F. 918.
Daloz, E. 917.
Damel, C. S. 158.
Dameno, E. 158.
Dancy, A. B. 917.
Danis, M. 323, 427, 478, 501, 560, 601, 785, 915.
Darier, A. 77, 156, 237, 238, 392, 394.
Darrieux, J. 637, 853.
Davids, H. 314.
Davies, D. L. 476.
Davis, A. E. 77, 657, 851.
Davis, S. C. 479, 917.
Davison, H. P. 777.
Dean, F. W. 883.
Debré, R. 475, 638.
Decherd, H. B. 238, 476.
Deelman, H. T. 917.
Degrais, 80, 240.
Dehogues, H. L. 913.
Delage, Y. 784.
Delany, T. H. 315.
Delorme. 238, 559, 639.
Demaria, E. B. 157, 393, 395, 476, 556.
Demoll, R. 918.
Dénéchau. 640.
Denes, M. 317.
Denig, R. 256, 395.
Dennis, D. N. 497, 714.
De Pena, P. 478.
Derby, G. S. 478, 854.
Dercum, F. X. 638.
Detlefson, J. A. 917.
Detzel. 916.
Deutsch, E. 349, 479, 560.
Deutschmann, R. 715.
Dewaele. 476, 783.
Dewey, J. H. 526, 714, 767, 914.
Dewey, K. W. 716.
Dianoux. 78, 237.
Dickinson, W. G. 89, 240, 358, 478, 587, 785.
Didier, P. 559.
Dietz, A. 316.
Dimitry, T. J. 240, 314, 477, 640.
Dinger, J. E. 314, 315.
Dock, G. 559.

Doesschate, G. 78, 80, 316, 318, 394, 713, 782, 912.
Doilken. 237.
Dolman, P. 77, 258, 392, 555.
D'Ombrain, E. A. 638.
Donaldson, C. A. 159.
Dor, L. 237, 392, 394, 395, 475, 640, 785.
Dowling, J. I. 557.
Doyne, P. G. 688, 912.
Drachter, R. 395.
Dragozzi, G. 852.
Dransart. 637.
Dresbach, M. 638.
Druault, A. 396.
Drummond, W. B. 319, 480, 560.
Duane, A. 240, 555, 697, 713.
Dubreuil. 394.
Ducamp, A. 558.
Ducatteau, H. 785.
Duclos. 917.
Dufour, M. 237, 782.
Duhamel, A. 79, 785.
Duhot. 395.
Dujardin. 147, 785.
Dumolard, A. G. 784.
Dundas, G. H. G. 475.
Dunn, A. D. 917.
Dunn, J. 556.
Dunn, P. 77.
Dunnington, J. H. 912.
Duperie. 395, 474.
Dupuy-Dutemps. 852, 912.
Du Seutre, J. 915.
Dusser de Barenne, J. G. 314.
Dutoit, A. 476.
Duverger, C. 237, 314, 320, 782, 849.
Dwyer, J. G. 833.

Eaton. 319.
Eaton, F. B. 422, 556.
Ebstein, E. 786.
Eckstein, A. 713, 784.
Economo, G. 917.
Edridge-Green, F. W. 477, 516, 558, 639, 715, 845, 851.
Edwards, J. D. 914.
Ehnhuus, E. 240, 395, 475.
Eigler, C. O. 135, 239, 452, 558, 715, 822, 912.
Eisner, E. 850.
Ellett, E. C. 314, 732, 852, 853, 917.
Elliot, R. H. 156, 393, 480, 783, 911.
Elmer, W. H. 159.
Elschnig, A. 315, 395, 913.
Elworthy, H. S. 392, 912.
Emard, P. 480.
Endell. 912.
Engelking, E. 713, 714, 784, 913.
Enright, J. 238, 394.
Enroth, E. 475, 638, 913.
Eperon. 847, 849.
Epstein, J. 316.
Erb, A. 319, 480.
Erggelet, H. 912.
Espino, J. M. 80, 916.
Esser, A. 478.
Esser, I. F. S. 239, 715.
Evans, J. J. 80, 317, 320, 476.
Evans, J. M. 755, 911.
Evershed. 390.
Ewing, A. E. 5, 156, 851.

Faber, O. 314.
Fage. 239.
Fagin, R. 395.
Farnarier. 475.
Feder, H. 318.
Fehr, O. 314, 392, 639.
Feilchenfeld, W. 785.
Feingold, M. 499, 715.
Fenton, R. A. 284, 317, 343, 475, 854.
Fergus, F. 240.
Fernandez, F. M. 78, 159, 284, 393, 641, 851.
Fernandez, H. U. 157.
Ferree, C. E. 24, 158, 159, 335, 408, 475, 555, 715, 772, 784, 812, 911, 915.
Ferro, P. B. 317.
Fewell, A. G. 279, 482, 765, 911.
Fiebiger, J. 639.
Fiessinger, N. 240.
Fietta, P. 315.
Filbry. 471.
Filehne, W. 915.
Findlay, E. K. 617, 785.
Finlay, C. E. 78, 715, 914.
Finnoff, W. C. 132, 133, 161, 238, 239, 316, 360, 373, 475, 537, 538, 559, 715, 899.
Fischel, A. 317.
Fischer, B. 318.
Fischer, J. 912.
Fisher, R. A. 395.
Fisher, W. A. 741, 887, 892, 900, 911.
Fison, J. 914.
Fitzgibbon, G. 783.
Flack. 319.
Fleck. 393, 395.
Fleisher. 785.
Fleisher, B. 157, 768, 783, 913.
Fleisher, J. 783.
Fleming, N. B. 158, 438, 559
Flesch, J. 392.
Fletcher, R. 476.
Flexner, S. 395.
Folman, M. 315.
Fontan. 715, 915.
Foreman. 480.
Forns. 157.
Fort, A. G. 716.
Fossataro, E. 558.
Foster, N. B. 831.
Fox, H. 916.
Fox, L. W. 159, 393, 786.
Fradkine, S. 79.
Fraenkel, E. 853.
Francis, L. M. 291, 395, 872.
Frank, M. 640.
Franke, E. 479, 913, 915.
Franklin, W. S. 643, 851.
Fraser, A. C. 159.
Fraudet, H. 318.
Frazier, C. H. 784, 852.
Frenkel, H. 316, 716, 785.
Frias, Onate, A. 77.
Fridenberg, P. 853, 917.
Friede. 556, 714, 840, 913.
Friedenwald, H. 394, 560, 858.
Frisch, K. 396.
Fromaget, C. 639, 559.
Fromaget, H. 639.
Fuchs, A. 239, 317, 558.

Fuchs, E. 238, 318, 393, 476, 556, 637, 638, 713, 714, 715, 716, 850, 851, 852, 853.
Fulleborn, E. 916.
Fusita, H. 638.
Fusiwara, K. 638.
Fuwagawa, Y. 556.

Gabrielides, A. 556, 637, 640.
Galant, S. 916.
Gallemaerts, E. 237, 365, 555, 713, 835, 911.
Gallenga, G. 393, 913.
Gallus, E. 393, 913.
Gamble, W. E. 617, 785.
Ganguli, P. 849.
Garcia del Mazo, J. 157.
Garcia Mansilla, S. 315, 475, 478, 917.
Garraghan, E. F. 138, 238.
Garrahan, J. P. 475, 713, 851.
Garroud, A. 851.
Garza, J. U. 851.
Gaupillat. 77.
Gaus. 849.
Gautrand, G. 473.
Gavezzenski, S. 915.
Gazepis, Z. 318.
Gelb, A. 158, 852.
Gellhorn, E. 915.
Georgopoulos, S. 315.
Gerard, M. G. 77, 238, 475, 783.
Gertz, H. 713.
Giannelli, A. 478.
Gibson, J. L. 716, 885, 886, 913.
Giffo, F. 912.
Gifford, H. 787, 843, 914, 917.
Gifford, S. R. 97, 238, 433, 557, 602, 785, 850, 913.
Gil, R. 79, 478, 852.
Gilbert. 914, 918.
Gilbert, W. 157.
Gill, A. W. 832.
Gill, E. G. 637.
Giltner, H. W. 911.
Ginsberg, S. 914.
Girard, P. 716.
Giri, D. V. 315, 317.
Giron, J. 319.
Gjessing, H. G. A. 638, 709, 851.
Gleichen, A. S. 637.
Godwin, D. E. 475.
Goes, M. de. 475.
Goldberg, H. G. 527, 713.
Goldenburg, M. 139, 238, 239, 678, 851.
Goldflam, S. 916.
Goldsack, L. C. 157.
Goldscheider. 556.
Goldschmidt, W. 395.
Goldstein, K. 158, 852.
Golseth, G. 238.
Gomes, P. 318.
Gonin, J. 57, 158, 558.
Gonzalez-Alvarez, M. 80.
Gonzalez, J. de J. 78, 80, 127, 237, 238, 392, 475, 559, 700, 713, 849, 851, 853, 918.
Gonzalez Sanchez, P. 852.
Goodall, E. B. 555.
Gordon, A. 394, 637, 639.
Goris. 852.
Gorst, P. E. 240, 638.
Goto. 557.
Gould, G. M. 77, 145, 392.
Goulden, C. 478, 516, 716.
Gouvea, H. de. 478.
Goux, J. L. 75.
Govens, H. L. 396.
Gradle, H. S. 41, 157, 560, 818, 853, 914.
Grafe, E. 849.
Grasemann, P. 480.
Greeff, R. 713, 918.
Green, A. S. 393, 428, 556.
Green, J. Jr. 477, 479.
Green, L. D. 393, 428, 556.
Greene, A. 320.
Greenwood, A. 285, 396, 478, 480, 918.
Greenwood, J. 912.
Grier, G. W. 159.
Griffith, C. R. 314, 392.
Grignolo, F. 394.
Grimsdale, H. 437, 475, 559, 906.
Griscom, J. M. 827, 913.
Grober. 782.
Gros. 783.
Grosz, E. v. 157.
Grouvich, A. 475.
Grünbaum, A. 148, 713.
Grüter, W. 850.
Grütter, E. 768, 853, 913.
Grynfeltt, E. 783, 785.
Guglianetti, L. 157, 314, 319, 560, 713, 783.
Guijarro y Carrasco, M. 715.
Guillain, G. 79, 906.
Guillaume, A. C. 917.
Guiral, R. 78, 393.
Guist. 558, 850.
Gummich. 785.
Günther. 639.
Gutmann, A. 917.
Guyer, M. F. 560, 917.
Guyton, B. S. 111, 239.
Guzman. 556.

Haas, H. K. de. 316, 639.
Haenel, H. 915.
Hagen, S. 913.
Hagemeyer, A. J. C. 784.
Hajek, M. 915.
Hala, W. W. 240.
Hall, G. W. 476.
Hallett, De W. 476.
Halliday, J. C. 885.
Hambresin. 364, 366, 557.
Hamill, R. C. 477.
Hammes, E. M. 319.
Handmann. 476.
Hanna, H. 320.
Hannemann, E. 913.
Hansell, H. F. 208, 295, 318, 478, 521, 522, 559, 571, 714, 715, 824.
Hansen. 479.
Hanssen. 912, 914.
Harboe, J. F. 558, 784.
Hardwicke, W. W. 475, 637.
Hardy, W. F. 517, 713, 716.
Haren, 852.
Harkness, C. A. 396.
Harman, N. B. 80, 319, 438, 555, 559.
Harper, G. S. 918.
Harrington, R. R. 370, 372, 556, 558.
Harris. 315.
Harris, J. D. 158.
Harry, P. A. 80, 475, 913.
Hartridge, H. 156, 157, 158, 715.

Haselberg, V. 393.
Hasselmann. 478.
Hathaway, W. 396.
Haughey, I. W. 197, 314.
Hauss, von. 476.
Hawthorne, C. O. 480.
Hay, P. J. 314, 319.
Hay, J. 785.
Hayes, S. P. 317.
Hazen, E. H. 237, 713.
Heagey, F. W. 917.
Healy, J. J. 782.
Hecht, S. 639, 784, 914.
Heflebower, R. C. 156, 237.
Hegler, C. 915.
Hegner, C. A. 316.
Heidrich, A. 713.
Heimann, E. A. 392, 713.
Henderson, E. E. 239, 317, 785.
Henker, O. 156.
Henning, H. 716.
Hensen, H. 319, 782, 849.
Hepburn, M. 79, 144, 239.
Herbert, H. 238, 316, 476.
Hering, E. 911.
Herrenschwand, F. v. 478, 640, 917.
Hershberg, H. 80.
Hertz, V. 912.
Hess, C. v. 475, 783, 784, 911, 918.
Hessberg, R. 714, 785, 853.
Heusen. 852.
Higgens, C. 475.
Higgens, S. G. 373, 560.
Hijikata, Y. 78.
Hikita, N. 639.
Hilbert. 475.
Hill, E. 475.
Hill, W. W. 80.
Hilton, H. O. 240.
Hine, M. L. 146, 318, 394, 688, 852.
Hinojar. 852.
Hinrichs, S. 913.
Hippel, E. v. 395.
Hird, R. B. 317.
Hirsch. 239, 917.
Hirsch, G. 784.
Hirschberg, J. 80, 157, 476, 479, 480, 638, 639.
Hirsel. 914.
Hiwatari, K. 78, 157, 238, 556.
Hochgurtel, M. 392.
Hoeg, N. 475, 915.
Hoeve, J. van der. 178, 314, 316, 319, 555, 911, 916.
Hoezkneckt. 159.
Hofman, F. B. 784.
Hogue, G. I. 80, 159, 319, 782.
Holban, D. 315.
Holloway, T. B. 297, 380, 381, 476, 555, 557, 558, 765, 824, 826, 911.
Holm, E. 638, 639, 783, 914.
Holmes, C. R. 154, 307.
Holth, S. 146, 911.
Homver, M. 318.
Hoor, K. von. 157, 913.
Hoover, C. F. 916.
Hori, S. 77.
Horn, H. 237.
House, W. 237.
Howard, C. N. 332, 559.
Howard, H. J. 77, 417, 475, 555, 589, 702, 713, 784.
Howe, L. 291, 396, 479, 480, 912.
Hubeny, M. J. 559.
Hueber, A. A. 701, 852.
Hughes. 783.
Hughes, H. S. 713.
Hunt, E. L. 79.
Hunter, E. L. 850.
Huppenbauer, K. 315.
Hurst, A. F. 784, 832.
Hyatt, E. G. 850.
Hyde, E. P. 713.

Ichikawa, K. 477.
Ide, C. E. 237.
Igersheimer, J. 317, 560, 639.
Imamura, S. 477.
Imbert. 159.
Ingersler, F. 637.
Ingham, S. D. 784.
Iredell, C. E. 77.
Irvine, A. R. 238.
Irwin, S. V. 240.
Isola, A. 915.
Israel, E. B. 853.

Jackson, E. 70, 80, 150, 153, 158, 160, 239, 240, 302, 304, 384, 386, 392, 393, 397, 480, 548, 549, 555, 557, 560, 626, 627, 629, 705, 708, 713, 716, 774, 782, 786, 788, 844, 851, 853, 855, 894, 895, 897, 902, 904, 906, 907, 911, 914, 918.
Jackson, T. S. 852.
Jacovides. 318.
Jacqueau. 639, 715.
Jaensch, E. 852.
Jakob, H. 918.
James, R. R. 79.
James, W. B. 833.
Janacek, R. 851.
Janeway, H. H. 555.
Janzen, E. 851.
Jeandelize, P. 318, 713, 715, 912.
Jennings, J. E. 558, 915.
Jeremy, H. R. 54, 159.
Jervey, J. W. 850, 913.
Jess, A. 703, 713, 715, 716, 853, 911, 914.
Jickeli. 913.
Jobson, J. B. 293, 393.
Jocqs, R. 715, 784.
Johnson, H. M. 476.
Joly, J. 317.
Jones, E. L. 392, 455.
Jones, R. H. 559.
Jordan, A. 238.
Jorge, J. M. 158.
Joughin, J. L. 240.
Juarros, C. 853.
Judd, E. S. 852.
Junius. 917.

Kahn, R. H. 638, 913.
Kalt. 559.
Kammerer, P. 639.
Kan, P. T. L. 912.
Kappers, A. 639.
Karelus. 315.

Karrer, E. 914.
Katheriner, L. 918.
Kato, T. 913.
Katz, J. 77.
Kearney, J. A. 80, 854.
Keen, A. 396.
Keller, K. 852.
Kelly, H. A. 846.
Kennon, R. B. 697, 715, 716.
Kenny, A. L. 885, 918.
Kerbrat, Y. V. J. 317, 914.
Kern, B. v. 314.
Kerr, D. 395.
Kerry, R. 341, 476.
Kestenbaum. 783.
Key, B. W. 78.
Key, S. N. 684.
Keyser. 395.
Kiefer, H. A. 157.
Kiep, W. H. 319.
Killen, W. M. 316.
Kirchner, M. 157.
Kirkpatrick, H. 157, 556, 558.
Kirschmann, A. 315.
Kisch, B. 785.
Kiss, J. 849.
Kjolbye, J. 639.
Klauber, E. 478, 913, 917.
Kleefeld, G. 237, 365, 478, 555, 556, 849. 713, 835, 911.
Kleijn, A. de. 314, 782, 784.
Klock, von. 475.
Kluge, A. 783.
Knack. 914.
Knapp, A. 79, 87, 238.
Knapp, P. 916, 917.
Knorr, E. A. 393, 394.
Koby, E. E. 314, 637.
Koegel, H. 77, 911.
Koeppe, L. 555, 637, 638, 784, 911.
Koerber. 478.
Köfler, A. 477.
Köfler, K. 478.
Koller, C. 238.
Köllner, H. 474, 475, 777, 913, 916.
Kolmer, W. 640.
Komoto, 638, 639.
Kooy, J. M. 393.
Koster, W. 911.
Kosterlitz, T. 479.
Kraemer. 914.
Kraupa, E. 318, 396.
Kraupa-Runk, M. 158.
Krauss, F. 66, 166, 317, 379, 558, 715.
Krebs, A. 441, 559.
Kreidlova, A. 850.
Kretschmer. 478.
Krinsky, J. 475.
Krückmann. 159, 639, 914.
Kruse, F. W. 783.
Krusius, F. F. 396.
Kubik, J. 916.
Kuboki, H. 638.
Kuhl, A. 912.
Kuhlefelt, E. 396.
Kuhnt. 157.
Kümmell, R. 477, 479.
Kuznitsky, E. 395.
Kyle, J. J. 847.
Lacah. 639.
Laconture. 852.
Lacroix, A. 318, 479, 715, 915.
Lafarque. 240, 716.
Lafon, C. 77, 298, 471, 555.
Lagarde. 912.
Lagrange, F. 80, 239, 316, 318, 395, 557, 851.
Lagrave, E. J. 917.
Lahey, F. H. 478.
Laignel, L. 912.
Laiseca, N. F. 157.
Lal, B. H. 914.
Lamb, A. R. 913.
Lamb, R. S. 394, 459, 888, 891, 893, 896, 900.
Lampert, P. 478.
Lancaster, W. B. 394, 457, 480, 849.
Landolt. 363, 555.
Landolt, E. 317.
Landolt, M. 8, 237, 238, 475.
Lane, F. 78.
Lang, B. T. 77, 314.
Langdon, H. M. 527, 716.
Langmead, F. S. 396.
Langrock, C. 916.
Lanier, L. H. 394.
Lantuejoul. 392.
Lapersonne, F. de. 77, 80, 159, 239, 240, 318, 362, 393, 479, 559, 560, 640, 716, 785, 850, 853.
Larkin, B. J. 392.
Larsen, H. 639, 716, 916.
La Rue. 134, 240.
Latil. 157.
Lauber, H. 475, 638, 850.
Laurance, L. 782.
Laval, F. 319.
Lawford, J. B. 392.
Lawson, A. 317.
Layson, Z. C. 433, 559.
Lea, J. A. 849, 850.
Leavitt, M. J. 237.
Lecene, P. 477.
Lederer. 317.
Lehmann, R. 917.
Leidler, R. 912.
Lemmer, L. 475.
Lemoine, P. 639, 715.
Le Pendu. 157.
Leplat, G. 366, 479, 559, 852, 853.
Lereboullet, P. 917.
Leri. 237.
Leriche, R. 916.
Le Roux, H. 395, 851.
Letulle, M. 716.
Levin, I. 392.
Leventhal, J. H. 77.
Levinsohn, G. 78.
Lian, C. 853.
Libby, G. F. 373, 477, 556, 559.
Liddell, H. S. 77.
Lidwill, M. C. 77.
Liebermann, L. 159.
Liégard. 79, 395.
Lindahl, C. 318, 637, 784.
Lindberg, J. G. 556.
Lindgren. 238, 298, 476, 639, 787.
Lindner. 238, 852, 913, 917.
Lister, A. E. J. 78, 914.
Lister, W. T. 146, 318.
Litvak, A. 849.
Llwellyn, T. L. 237, 392, 849, 854, 912.
Lloyd, J. H. 319.

Lloyd-Owen, D. C. 240.
Lobel, A. 470.
Lockhart, R. 556, 560.
Loeb, C. 121, 240, 293, 299, 381, 475, 845, 902, 904, 918.
Loeb, H. W. 913, 915.
Lockwood, R. M. 475.
Lodge, O. 317.
Löhlein, W. 480, 637, 916.
Lohmann, W. 915.
Lombardo, M. 747, 912.
Lomon, 559.
Longcope, W. T. 831.
Looper, E. A. 394.
Lopes, L. 480.
Lortat-Jacob, L. 912.
Losno. 913.
Lottrup-Anderson, C. 78, 237, 475.
Loughborough, G. T. 853.
Love, L. F. 290, 395, 782.
Lowe, L. 479.
Lowell, W. H. 275, 393.
Löwenstein, A. 78, 475, 476, 639, 716, 769, 913.
Lowenstein-Brill. 639, 915.
Lowery, L. G. 850, 913.
Luc, L. 476.
Luckiesh, M. 240.
Luedde, W. H. 238.
Lundsgaard, K. K. 912.
Lüssi, W. 476.
Lynch, R. C. 318.

McAll, P. L. 159.
MacAuliffe. 917.
MacCallan, A. F. 240, 769.
McCaw, J. A. 131.
McDavitt, T. 556, 558, 559, 560.
McDonnell, W. C. 80.
Macfie, J. W. S. 556.
McGuire, H. H. 315, 850.
McHenry, D. D. 917.
McIlroy, J. H. 480, 560.
McIntire, C. 309.
Mackay, H. 237.
McKee, S. H. 239, 394.
McKellar, J. H. 209, 318, 603, 784.
McKenzie, D. 396, 852.
McKeown, E. E. 132, 239.
McLean, W. 557.
Macleod, G. 393, 395.
MacLeod, R. A. 784.
McMillan, A. L. 916.
McMullen, J. 54, 159.
McMullen, W. H. 516, 687, 688, 714, 716, 852, 853, 913.
McMurtrie, D. C. 480.
McPherson, G. 240.
McReynolds, J. O. 900.
Machts, L. 918.
Maddox, E. E. 23, 156, 475, 556, 911.
Maderna, C. 637.
Maggiore, L. 640.
Maghy, C. 444, 533, 557, 714.
Magill, E. M. 480.
Magitot, A. 238, 239, 475, 638, 714, 784, 851.
Magruder, A. C. 377, 557, 611, 620, 785.
Mahoney, G. W. 784.
Majewski. 237, 395.
Malagodi, A. 156, 392.
Malling, B. 79.
Malvoz. 475.
Mancini, U. 853.
Mangini, L. 477.
Mann, L. 394, 851.
Mann, R. T. 850.
Manoïla. 314.
Manson, M. A. 479.
Mansur, L. W. 476.
Marbaix. 238, 475, 714, 853.
Marbourg, E. M. 67, 158.
Marburg, O. 784.
Marechal, H. 237.
Margarot, J. 479.
Margarucci. 473.
Marie, P. 785, 906.
Marín-Amat, M. 559, 640, 853.
Marine, D. 916.
Marinosci, R. 157.
Marks, E. O. 886.
Marlow, F. W. 392.
Marongiu, L. 395.
Marquez. 79, 479.
Martel, P. 480.
Martens. 918.
Martin, A. 80.
Martin, H. H. 558, 559, 560.
Martin, L. C. 716.
Martin, M. J. 479.
Marx, E. 850, 911, 918.
Mas Soewarno. 78, 914.
Masuda, T. 558, 638, 639.
Matsuoka, Y. 564, 783.
Matthews, R. H. 317.
Mawas. 559.
Maxey, E. E. 80, 239.
Maxted, G. 159, 912.
Maxwell, E. 315.
Maynard, F. P. 146, 238, 555, 640.
Mayou, M. S. 314, 317, 318, 786.
Mazeres, G. 637.
Mazzei, A. 158, 393, 476, 557, 558, 783, 835, 918.
Meade, J. N. 80.
Means, J. H. 79.
Meder. 475.
Meirello, E. 158.
Meisling. 637.
Meissner, M. 784, 854.
Meller, J. 640, 784, 917.
Mello, G. de. 475.
Menacho, M. 78, 157, 393, 478, 640, 785, 913.
Mendel, F. 477.
Mendoza, R. 77.
Merg, H. 918.
Merida, N. 556.
Metty, 237, 394, 918.
Metzger, I. D. 782.
Meyer. 638.
Meyer, G. 714.
Meyer, H. 394.
Meyer, R. C. J. 479.
Meyerburg, v. 852.
Myerhof, M. 320.
Meyling, H. J. 395.
Mezincescu, D. 315.
Michel, R. 918.
Milian, G. 237.
Miller, C. M. 238.
Miller, E. B. 782, 783, 785, 850, 918.

Mingazini. 852.
Molinie. 849.
Monauni, C. 395, 785, 787, 839, 917.
Monbrun, A. 238, 239, 477.
Monchy, S. J. R. de. 639.
Mongel, E. B. 763, 915.
Montaño, E. F. 475, 849, 851.
Mooney, H. C. 315.
Moore, R. F. 916.
Morax, V. 316, 318, 319, 477, 478, 559, 561, 639, 716, 783.
Moreau, F. 240, 394, 784.
Morgan, A. D. 716.
Morrison, F. A. 685.
Morton, H. McI. 402, 556.
Morse, S. 555.
Mosher, H. P. 394.
Moss, L. 156.
Motais. 318, 880.
Motolese, F. 318.
Moulton, H. 850.
Moure, P. 319.
Monquet, A. 912.
Mukai, H. 637, 913.
Muller, E. 782, 784.
Muller, L. 475, 911, 913.
Muller, M. 318, 915.
Murray, A. N. 141, 240.
Muskens, L. 852.
Mussio-Fournier, J. C. 915.
Myake, Y. 638.
Myashita, S. 556, 638.
Mygind, S. H. 478.

Nadal, R. 392, 851.
Naegeli. 479.
Nagel, C. S. G. 239, 327, 406, 473, 559.
Nager. 317.
Nakamura, B. 472, 638.
Natale. 158.
Neeper, E. R. 66, 157, 159.
Neill, W. 159.
Nelson, V. E. 913.
Nestlinger. 783, 913.
Netter. 319.
Netto, C. 314.
Neubner, H. 317.
Neunhoeffer. 715.
New, G. B. 244, 395.
Newcomb, J. R. 392, 396.
Nicati, A. F. 851.
Nicolle, C. 393, 637, 913.
Nicolet. 912.
Nicolau. 157.
Nicolich, M. 157, 393.
Nicolls, F. 157.
Nordenson, J. W. 79, 914.
Norris, C. 394.
Nunes. 477.
Nutting, P. G. 558.

Oblath, O. 395.
O'Brien, J. A. 80.
Ochoterena, I. 317.
Ochsenius, K. 318.
O'Connor, R. 116, 237, 726, 914.
Odeneal, T. H. 80.
Oertel, T. E. 814, 916.
Oesterreicher, L. 79.
Oetteking, B. 159.
Offret. 395, 556, 559, 716.
Oguchi, C. 558, 637.
Ohno. 559.
Ohsaki. 557.
Ōkamura, S. 637.
Okasaki, G. 315, 638.
Olenchiu. 638.
Oliver. 80, 744.
Oliveres. 316.
Oloff, H. 79, 159, 915.
Olsho, S. L. 481, 713.
Onishi, K. 639, 640, 839, 918.
Oppenheimer, S. 640.
Oreste, A. 393.
Ormond, A. W. 687, 853.
Ourgaud. 157, 159, 318, 476, 913.
Oyenard, A. 158.

Paderstein. 913.
Pagniez, P. 785, 851.
Paillard. 853.
Palich-Szanto, O. 913.
Paneth, L. 475.
Paraf, J. 471, 638, 713, 785.
Pardee, I. H. 477.
Park, J. W. 638.
Parker, R. H. 393.
Parker, W. R. 284, 736, 915.
Parsons, J. H. 54, 158, 319, 320, 475, 515, 639, 714, 715, 784.
Passow, A. 913.
Paton, L. 318, 515, 516, 713, 714.
Patterson, J. A. 135, 238, 240, 896.
Patterson, W. E. 640.
Patton, J. M. 786.
Pauly, R. 156, 392.
Pearson, A. 396, 480.
Pearson, W. W. 849.
Pech, C. R. 477, 715.
Pech, J. S. 715.
Pedarre, M. J. J. A. 714.
Peirson-Webber, F. 560.
Pelayo. 156.
Pelfort, C. 77.
Percival, A. S. 80.
Pereyra, G. 318, 394, 473.
Perol, B. 318.
Perrin, T. G. 157, 918.
Perry, T. E. 557.
Pesme, P. F. 479, 912.
Peter, L. C. 239, 295, 296, 392, 477, 524, 557, 584, 713, 782, 911.
Peters, A. 783.
Peters, R. 479.
Peyrelongue, E. de. 396, 714, 916.
Pfeiffer. 77.
Pfingst, A. O. 129, 237, 560, 716.
Phelps, K. A. 39, 156.
Phillips, W. H. 851.
Pichler, A. 157, 158, 479, 786.
Pick, A. 852, 915.
Pick, L. 560.
Pieron, H. 784.
Pincus, F. 158.
Pischel, K. 238.
Pissarello, C. 157, 393, 783, 913.
Pitschack. 479.
Place, R. W. 686, 849.
Pockley, F. A. 393.
Pockley, G. A. 393, 559, 639.
Poisson. 473.
Polack. 558.
Pollock, W. B. I. 315.

Pollot, W. 912.
Portman, G. 916.
Portillo, J. W. 78.
Posey, W. C. 206, 394, 507, 523, 557, 693, 714, 761, 762, 852, 853, 911, 916.
Possek, R. 392, 479.
Post, L. 911.
Post, M. H. 277, 393.
Potts, G. , 78, 143, 238, 239.
Potts, H. A. 394.
Potts, J. B. 195, 319.
Pötzl, O. 317.
Poulard. 78, 557, 558, 559, 639.
Poyales, F. del. 394, 478, 639, 917.
Prates, M. M. 916.
Prélat. 77.
Prevedi, G. 156.
Prince, A. L. 77.
Pronger, C. E. 782.
Pulleine, R. 637.
Purtscher, O. 238, 477, 479, 715, 911.

Quick, D. 558.

Rabl, G. 317.
Rados, A. 914.
Ralston, W. 393.
Ramon, C. V. 783.
Ramsay, A. M. 480, 560, 915.
Rand, G. 24, 158, 159, 335, 408, 475, 555, 715, 784, 812, 911.
Randolph, R. L. 75.
Raoulx. 394.
Rasquin, E. 147, 475, 785, 913.
Rauch, R. 158, 473.
Raueiser, A. 318.
Raulston, B. O. 477.
Ravdin, B. D. 159.
Ravoux, P. 560.
Raynor, W. P. 315.
Redding, L. G. 555.
Redfern, T. C. 639.
Redslob, E. 786.
Reed, C. B. 918.
Reed, C. I. 395.
Reeder, J. E. 852.
Reese, R. G. 832, 853.
Rehm, O. 849.
Reiche, O. C. 638.
Reid, H. 917.
Rejto, A. 849.
Remak. 713.
Rendleman, W. H. 559.
Rennie, G. E. 79.
Ribon, V. 79, 80, 555.
Riddoch, G. 852.
Ridley, N. C. 478.
Riedel, A. H. 79.
Ring, G. O. 529, 714.
Rinkes-Huygen, A. C. 694, 850.
Risley, S. D. 297, 356, 475.
Riva, G. 475, 638.
Robert, G. 849, 911.
Roberts, B. H. St. C. 314, 317.
Robertson, E. N. 820, 914.
Robin, E. A. 913.
Rocha, N. da. 479.
Rochat, G. F. 317.
Rocher, L. 715.
Rochon-Duvigneaud, A. 159, 240, 786, 853.
Roelofs, C. O. 770, 784, 911
Roemhold, L. 853.
Rohde, M. 853.
Rohr, M. 80, 316, 912, 918.
Rolandi, S. 716.
Roll, G. W. 437, 557, 687, 850.
Rollet, E. 395, 638, 474, 914.
Romer, P. 240, 393, 478.
Romulo, G. 478.
Roubinovitch, J. 849.
Ronchetti, V. L. O. 918.
Rönne, H. 149, 638, 701, 850, 912, 914, 915.
Roorda-Smit, J. A. 393.
Rosenblatt, S. 918.
Rosenheck, C. 158.
Rousseau, R. 80, 239, 240.
Rowan, J. 608, 783.
Roy, D. 80.
Rozsa, J. 475.
Ruiz, J. M. 77.
Ruiz, R. G. 785.
Rumbar, W. 318.
Rush, C. C. 869, 816, 914.
Russ, S. 317.
Rutherford, W. J. 557.
Ruttin. 556, 852.
Ryley, C. M. 77.

Sadek, M. T. 318.
Saenger, A. 394, 852.
Sage, F. C. 476.
Saint-Martin, de. 317, 394, 396, 477, 560, 783.
Sakaguchi, K. 637.
Salisbury-Sharpe, W. 916.
Salterain, J. de. 78, 316, 477, 479, 716, 915.
Salus, R. 315, 395.
Salzmann, M. 477.
Samaja, N. 916.
Sandiford, I. 559.
Santa-Cecilia, J. 912, 918.
Santonoceto, O. 392.
Santos-Fernandez, J. 78, 79, 80, 477, 696, 851.
Santanowsky, P. 318.
Sattler, R. 714, 917.
Sauer, W. E. 852.
Sauvineau. 393, 556, 716.
Scarlett, H. 396, 454, 63, 159.
Schaeffer, G. P. 394.
Schanz, F. 911.
Scheerer, R. 915.
Scheffer. 77.
Scherzer. 917.
Schiassi, B. 916.
Schieck. 393.
Schiötz, H. 475, 557.
Schiötz, I. 784.
Schmalfuss, G. 916.
Schmidt, F. F. 665.
Schmidt, H. 477.
Schnaudigel, O. 714, 840, 911, 913.
Schneider, R. 912.
Schneider, W. F. 475.
Schoenberg, M. J. 477.
Schorn. 392.
Schottenheim, O. 156.
Schreiber, L. 158.
Schriftleiter. 713.
Schruhoff. 393.
Schulz, H. 158.

Schurmann, F. 784.
Schutz, W. H. 475.
Schwarzkoff, G. 916.
Schweinitz, G. E. de. 64, 65, 157, 394, 560.
Schwenk, P. N. K. 65, 156, 295, 475, 758, 914.
Scolari, E. 78.
Scott, E. 665, 853.
Sculco. 78.
Sedan, J. 395, 475.
Seddik, Z. 316.
Sedwick, W. A. 130, 448, 557, 619, 785, 823, 911.
Seefelder, R. 479, 850.
Seeman, M. 916.
Seidel, E. 317.
Seimemi, E. 158, 159.
Sendral. 239, 318, 362, 785.
Senet, R. 79.
Severin. 392.
Sewall, H. 865, 895.
Sexton, E. W. 918.
Seyster, E. W. 396.
Sgrosso, S. 158, 394.
Shahan, W. E. 914.
Shanklin, E. M. 285, 396.
Shannon, J. R. 315.
Sharp, W. N. 314, 434, 560, 597, 782.
Shastid, T. H. 109, 239, 307, 631.
Sheard, C. 396, 558, 782, 783.
Sheppard, H. 715.
Shields, J. M. 238, 377, 449, 450, 556, 557, 560, 822, 914.
Shima. 316.
Shimazu, F. 639.
Shoemaker, W. T. 63, 159, 477, 528, 714.
Shumway, E. A. 523, 714.
Shute, A. C. 480.
Sicard, J. A. 785, 918.
Sichel, A. W. 558.
Siciliano, L. 237, 393.
Sidler-Huguenin. 474, 560.
Silva, L. 783.
Silvero, J. E. L. 80.
Silvio, F. 157.
Simon de Guilleuma, J. M. 639.
Simpson, W. H. 558.
Sinclair, A. H. H. 911.
Sinclair, W. 319.
Sinha, C. C. 913.
Sistrunk, W. E. 239.
Skversky, O. 80.
Sloan, H. L. 852.
Slonaker, J. R. 798, 918.
Small, C. P. 78.
Smati, A. 237.
Smith, C. M. 240.
Smith, D. T. 784.
Smith, E. T. 239, 640, 853.
Smith, H. E. 238, 314, 317, 637, 673, 851.
Smith, R. C. 109, 239.
Smith, T. 395.
Smith, V. C. 318.
Snell, A. C. 560.
Snyder, W. H. 714.
Snydacker, E. F. 612, 785.
Soewarno. 78, 914.
Solares, F. V. 315.
Sonder. 555.
Sonnen, A. 916.
Soria y Escudero. 475.
Soriano, F. J. 159.
Spaeth, E. B. 716.
Spalding, J. M. 156, 159.
Spearman, C. 320.
Spencer, F. R. 134, 240.
Spicer, W. T. H. 850.
Spiller, W. G. 315.
Spring, J. F. 319.
Stack, E. H. 319, 911.
Stahl, R. 849.
Stahlman, F. C. 849.
Staicovici, N. 475.
Stajduhar, J. 850.
Stargardt. 639.
Starck. 851.
Stark, H. H. 262, 396, 918.
Stassen, M. 156, 475.
Steen, V. 911.
Steiger, A. 912.
Stein, J. 440, 560.
Steinberg, A. 392.
Steinert, E. 319.
Steinheil, H. A. 637.
Steinitz, E. 784.
Stenger. 80, 560, 785.
Stepleanu-Horbatsky, V. 785.
Sternberg, J. E. 714.
Sternberg, J. S. 282, 394.
Stephenson, M. 850.
Stevens, C. W. 560.
Stevenson, E. 78.
Stewart, T. M. 558.
Stieren, E. 60, 440, 559.
Stierlin. 852.
Still, G. F. 478.
Stillson, M. 479.
Stilwill, H. R. 131, 238, 535, 714, 822, 917.
Stitzel. 475.
Stock, W. 913.
Stockard, C. R. 916.
Stocker, F. 58, 156.
Stoppato, U. 785.
Story, J. B. 319, 606, 640, 716, 786.
Strader, G. L. 448, 454, 556.
Stradiotti, G. 918.
Strange, C. F. 475.
Straub. 394, 557.
Strebel, J. 158, 239, 477, 560, 640.
Strickler, D. A. 375, 451, 556, 557, 558, 560, 619, 785.
Strohmayer, W. 475, 850.
Stuckey, E. J. 157, 783.
Suffa, G. A. 556, 713.
Suganuma, S. 638.
Suker, G. F. 534, 715, 716.
Sulzer, D. 476.
Sumner, P. 314.
Sutton, J. E. 638.
Swan. 393.
Sweet, W. M. 824.
Swift, G. W. 476, 547, 716.
Sykes, E. M. 556.
Sym, W. G. 319, 396.
Szily, A. von. 697, 715, 852.
Szily, P. von. 392, 907.
Sztanojevits, L. 784.

Taege, K. 913.
Takagi. 638.
Takao, J. 638.

Tanaka, K. 80.
Teal, F. F. 288, 394.
Terrien, F. 237, 315, 392, 394, 638, 784. 915.
Terson, A. 396, 555, 713, 783.
Teske, H. 394.
Thibert. 361, 557.
Thieke, A. 852.
Thiers. 237.
Thomas, D. O. 319.
Thomas, H. G. 239.
Thompson, A. H. 437, 558.
Thompson, H. M. 378, 379, 557, 560.
Thompson, J. H. 638, 886.
Thompson, J. W. 605, 785.
Thompson, T. 558.
Thomsen, H. 78.
Thomsom. 393.
Thomson, E. 160.
Thomson, E. S. 556.
Timme, W. 558.
Tindall, P. A. 479.
Titterington, M. B. 785.
Tixier. 475.
Tobbler, Th. 918.
Tobias. 319.
Todd, H. C. 916.
Tomlin, H. 157.
Tomomazu, Y. 640.
Tooke, F. T. 649, 853.
Torres-Estrado, A. 159, 850, 851.
Török, E. 851.
Toulant. 784.
Toussy, S. 79.
Trantas, A. 237, 479, 850, 918.
Trebilcock, F. C. 240.
Trerotoli, G. 849.
Tresling, J. H. A. T. 915.
Treutler, B. 911, 916.
Tricoire, R. 477, 784.
Triebenstein, O. 316.
Trombetta, E. 475.
Tscherning, M. 713.
Tubby, A. H. 319.
Tuberville, D. 477.
Turner, H. H. 441, 556.
Turner, W. E. S. 475.
Tuto, R. 317.
Tydings, O. 853.
Tyndall, E. P. T. 914.
Tyrrell, E. J. 79.

Uddgren, G. 475.
Uhlenhuth, E. 784.
Uhthoff, W. 314, 912, 916.
Underwood, H. L. 558.
Urbantschitsch, E. 784.
Uren, C. T. 170.
Uribe-Troncoso, M. 69, 160, 618, 851.
Urra, M. 149, 314, 395, 477, 850, 913.
Usher, C. H. 607, 783.

Vacher, L. 317.
Vail, D. T. 395, 714.
Valle, D. 79.
Valois, L. 475.
Vandegrift, G. W. 713, 849.
Van den Felden. 392.
Van Duyse. 79, 160, 239, 315, 320, 336, 559, 786.
Van Duyse, D. 366, 394, 478, 558, 559, 916.
Van Duyse, G. M. 79, 239.
Van Hoog, E. G. 915.
Vanhoutte. 637.
Vankirk, V. E. 61, 157.
Van Lint. 156, 237, 316, 317, 361, 367, 394, 475, 558, 559, 638.
Veach, O. L. 92, 238.
Veasey, C. A. 51, 77, 113, 158, 240.
Veis. 639.
Velard, H. E. 318.
Velasco, J. 917.
Velez, D. M. 849, 851, 852.
Velhagen. 917.
Velter, E. 237, 314, 315, 393.
Verger. 479.
Vergnet. 475.
Verhoeff, F. H. 157, 240, 471.
Verwey, A. 640.
Verzar, F. 913.
Vierling. 916.
Vigano, E. 911.
Vigouroux, V. 560.
Villard, H. 559, 639, 852, 913.
Villegas, A. 558.
Vincent, C. 784, 786.
Vinsonneau. 319, 785, 853.
Viterbi, A. 156, 556.
Viusa, S. 716.
Vogel. 918.
Vogt, A. 58, 157, 159, 238, 316, 319, 392, 476, 479, 713, 714, 851, 911, 914, 915, 918.
Von der Heydt, R. 447, 558, 618, 755, 782, 912.

Waardenburg, P. J. 850.
Wachs, H. 479.
Waele, H. de. 476, 783.
Wahrer, F. L. 818, 917.
Walker, C. C. 714.
Walker, C. E. 452, 557, 714.
Walker, S. 530, 716.
Wallace, F. E. 67, 159.
Walter, W. 201, 315.
Watanabe. 556, 637, 913.
Watari, S. 637.
Waterson. 480.
Watkins, S. S. 915.
Watkins, W. W. 80.
Watson, J. B. 785.
Watts, S. H. 639.
Wätzold. 237.
Webber, R. 852.
Webster, J. H. D. 319.
Weekers, L. 162, 237, 238, 314, 315, 316, 362, 476, 560, 783, 851.
Weeks, J. E. 476, 479, 557, 559, 784.
Weidler, W. B. 240.
Weigelin. 916.
Weill. 298, 472.
Weisser, E. A. 61, 158.
Wells, D. W. 78, 153, 237.
Welton, C. B. 79.
Werner, H. 315.
Werner, L. 240, 315, 316, 317, 318, 640.
Wernicke, O. 157.
Wertheim Salomonson, J. K. A. 477.
Wescott, C. D. 159.
Weskamp, C. 917.
Wessely, K. 157, 158, 159, 477, 783.
West, L. N. 555.
Westman, C. 396.

PLATES IN VOLUME III, 1920

Facing Page

Plate I. Syphilitic Neuroretinitis and Papilledema (Würdemann), Colors 1

Plate II. Proliferating Endophlebitis, Retinal Hemorrhage, Absolute Glaucoma. Examination of Excised Globe (Guyton), Colors 112

Plate III. Anomaly of Fundus (Finnoff) and Tuberculosis of Conjunctiva (Coover), Colors..... 161

Plate IV. Symmetric Macular Degeneration (Chance), Colors..... 241

Plate V. Ocular Fundus after Death (Würdemann), Colors..... 321

Plate VI. Pseudo Tumor of Choroid (Jackson), Colors..... 397

Plate VII. Pallor of Optic Disc Without Atrophy in a Case of Pituitary Tumor (Benedict), Colors..... 571

Plate VIII. Multiple Aneurysms of the Retinal Arteries (Fernandez), Colors 641

Plate IX. Reticular Keratitis (Byers), Colors..... 717

Plate X. Sections of Tumors of Optic Nerve (Blair)..... 794

Plate XI. Thrombosis of Retinal Veins after Influenza (Jackson), Colors 855

Westphal, A. 850.
Wetzel, R. 914.
Weve, H. 158, 315, 916.
Wheeler, J. M. 239, 251, 394, 916.
Whitaker, J. 480, 911.
White, E. H. 237.
White, J. W. 556.
White, L. E. 239, 560.
Whitehead, A. L. 319.
Whitham, L. B. 479.
Whitmire, A. 715.
Whitmore, H. W. 913.
Whitwell, A. 555.
Wiart. 315.
Wibaut, F. 314.
Wible, E. E. 61, 157.
Wieden, E. 78, 559, 783.
Wiegmann, E. 638, 915.
Wien, W. 480.
Wiener, M. 240, 393, 457, 852, 892.
Wiesner, D. H. 714.
Wilbrand, H. 784.
Wilder, W. H. 475, 534, 716.
Wilkinson, O. 435, 557.
Williams, T. A. 715.
Wilmer, W. H. 396, 480, 828, 850.
Wilson, J. W. 80.
Wimmer, F. E. J. 476.
Winfield, M. 317.
Wise, W. D. 78.
Wise, W. W. 315.
Wisselink, G. W. 913.
Wissmann. 852.
Wodak, E. 850.
Wolf, G. D. 479.
Wolfe, O. 818, 917.
Wolff, C. K. 315.
Wolff, L. K. 238, 917.
Wolflein, E. 316.
Wolfflin, E. 396, 915.
Wood, C. A. 302, 560, 708, 854, 918.
Wood, D. J. 849, 851, 853.
Woodland, E. E. 475.
Woodruff, F. E. 392, 560.
Woodruff, H. W. 611, 739, 785, 886, 890, 891, 914.
Woods, H. 77, 80, 136, 237.
Woog, P. 158.
Wright, C. D. 558.
Wright, W. W. 237.
Wunderlich, G. 915.
Würdemann, H. V. 1, 80, 153, 158, 210, 240, 300, 318, 321, 387, 475, 480,, 513, 551, 715, 756, 874, 906, 913.

Yerkes, R. M. 785.
Yokomazu, K. 639.
Yoshida, Y. 493, 638, 714.
Young, G. 316.
Young, H. B. 72, 160.
Young, W. J. 396.

Zade. 317.
Zaniboni. 639.
Zapatero-Vicente, P. 238.
Zeemann, W. P. C. 770, 784, 915.
Zeisler. 915.
Zentmayer, W. 62, 78, 156, 158, 296, 478, 653, 766, 824, 851, 912, 916.
Zethelius, M. 394, 477.
Ziegler, S. L. 280, 315, 381, 394, 560, 825 826, 912, 914.
Ziemssen. 638.
Zilva, S. S. 478.
Zimmermann, C. 907, 908.
Zimmermann, W. 319, 395.
Zoja, L. 918.
Zorn, B. 639.
Zotzdziowski. 316.
Zsako, S. 157.
Zur Nedden. 479, 911.

SUBJECT INDEX

A number in heavy face type gives the page of an original article, including transactions, editorials and correspondence. Numbers in (brackets) refer to abstracts, including those given in society proceedings. Other numbers indicate incidental mention of a subject as in the titles given in Ophthalmic Literature. Names are indexed separately. See p. v.

Abasia and hysteric blindness, 784.
Abducens paralysis, (378), 467, 912.
  and choked disc, 784.
Aberration, 157.
Abiotrophy, 316.
Abscess, brain, 852.
  fixation, 157, 237.
  of lids, 639.
  of orbit, 395, **876**, 917.
  of sclera, 78.
Absorption of lens, (767).
Abstracts, 67, 146, 226, 298, 383, 460, 538, 621, 694, 768, 835.
Accommodation, 77, 392, 474, 555, 637, 713, 918.
  and convergence, (298), (407).
  paralysis of in encephalitis, 849.
    after lightning stroke, 849.
  physiology of in birds, **798**.
Acetonuria, 676.
Acriflavin, 78.
Acromegaly, 319, (534).
Actinomycosis 80, **327**, 637, 638, 715.
Adaptation, 158, 638, 639, 715, 784, 849, 915.
Adduction, **878**.
Adenocylindroma, 716.
Adolescence, ocular hemorrhage in, 640, **652**, **657**, 851.
Adrenalin, 238, (835).
Advancement, 237, 314, 393, (457), **755**.
After cataract, 157, 238, **280**, (289),
  images, 79, 316.
Age and refraction, **228**.
Airol, **913**.
Alcohol, **315**.
Alexia, 477, 588, 639, 784.
  See also Word blindness.
Alkaloids, action on iris, 783, (835).
Alt, Adolf, 626.
Amaurosis, see Blindness.
Amaurotic idiocy, 239, 316, 851.
Ambylopia after injury, 318.
  hysteric, 159, (288).
  simulated, 237.
  See also Toxic amblyopias.
American Academy of Ophthalmology and Oto-Laryngology, 454, (469).
American Journal of Ophthalmology, **68**, 905.
American Ophthalmological Society, (285), (470).
Ametropia, (149), 782.
  and convex lenses, 637.
Amphitheatre for ophthalmic surgery, 314.
Anaphylaxis, 640, 851.
Anatomy, ocular, 480, 850, 853.
Anemia, pernicious, 316.
Anesthetics, 852.
  local, 238, **299**, (362), 558, 747, 782, 849.
  subconjunctival, 713.
Aneurysm of cavernous sinus, **144**, 239, **478**.
  of orbit, 79, 239.
  of retina, 641.
  of temporal artery, (534), (538).
Angiomatosis, 915.
Angioma of choroid, 785.
Aniridia, (515), 714.
Anisometropia, 392.
Anomalies, 239, 477.
  of canthus, (688).
  of color sense, 158.
  of fundus, **161**, (217).
  of iris, 475.
  of lid, 852.
  of muscles, 521, 556.
  of optic nerve, 158.
  of pupil, 850.
  of refraction, 237.
Anomaloscope, 911, 916.
Anophthalmia, 852.
Anterior chamber, 78, 157, 238, 315, 475, 556, 637, 714, 783, 836, 850, 914.
  changes in, 637.
  cilia in, **128**, **138**.
  copper wire in, (377).
  hemolysin in, 638.
  microscopy of, 637, 911.
Anterior segment, injury to, 785.
Antigens, 475.
Aphakia, operative, (620).
Aphykia retinae, **109**, **306**.
Apoplexy, corneal, 157, 913.
Appendicitis, 850.
Aqueous humor, 157, 914.
  and Wassermann, 315.
  composition of, 556.
  viscosity of, 157.
Arcus juvenilis, 783.
  senilis, (839).
Argyll-Robertson pupil, (147).
Argyrosis, 836.
Armamentarium, oculist's, (363).
Army of occupation, ophthalmic service in. **343**, **427**.
Arsenic, and retinal disease, 317, 915.
Arsenicomercury, 715.
Arsenobenzol, 237, 783, 853.
Arsphenamin, 477, see salvarsan.
Arteriosclerosis, 159, 392, (538), **674**, 716.
Artery, occlusion of central retinal, **48**.
Artificial eyes, 160, 394, 395, 487, (612), 916.
  light, 80, 239.
  pupil, 315.
Asphyxiating gas, **321**, 395, 475, 478, 583, 715.
Aspirin, 78.
Asthenopia, 77, (297), **356**, (841).
Asthma, 853.

Astigmatism, 77, (149), 157, 314, 392, (455), (516), 713, 782, 911, 912.
and myopia, 155, 713.
axis of, (222).
changes in, 228, 392.
Autopsy in ophthalmoplegia, 849.
Ataxia, 319.
ocular, 555.
Atresia of lacrimal duct, **406.**
Atrophy of choroid, 157, 476, 639, (828).
of iris, 837.
of optic nerve, 477, 558, 639, 915.
of retina, 157.
Atropin, 157, 474, (835).
intoxication after, 392.
test, 237.
Autoplasty, 79, 559, (625).
Aviation, 237, **258,** 314, 319, 320, 396, 480, 555.
and visual fields, 80.
effect of nose and throat upon ocular function in, **170.**
Avulsion of optic nerve, (54), (62), 558, 917.
Axis finder, **359.**
in astigmatism, (222), 912.

Bacillus capsulatus, 477.
Bacterial toxins and healing of wounds, 319, (462).
Bacteriotherapy and chemotherapy, 392, 913.
Baltimore Ophthalmological Society, 136, 224.
Bandages, 392, 713.
Barbitol poisoning, 783.
Barium sulphat, 851.
Barraquer's operation, (366), 714, **721,** 723, (770), 851.
Basedow's disease, 77, 639.
Bees, 158, 396.
Belat-Fraudet method of localization, 319.
Belgian Army, ophthalmic service in, **427.**
Ophthalmological Society, 361, 471.
Bernard-Horner syndrome, 158, 237, 396.
Binocular vision, 237, 315, 555, **705, 849,** 851, 916.
Biographic sketches, 307, 631, 778.
Biography, 80, 160, 240, 320, 396, 480, 640, 716, 786, 846, 854.
Birds' eyes, 240, 560, 716.
color of, 479.
double fovea in, 784.
physiology of accommodation in, **798.**
Blastomyces albicans, 79.
Blennorrhagic ophthalmia, 78, 913.
Blepharitis, 318.
Blepharoplasty, 79, 318.
Blepharoptosis, See ptosis.
Blepharospasm, 715.
Blind, 786.
Binet scale for, 320, 480, 560.
care of, 80, 396, 479, 640, 785.
education of 480, 786.
members of committee, 479.
pensions for, 480.
sight of the, 784.
what it is like to be, (551).
Blindness, 394, 560, 640, 916.
bilateral, 782, 849.
causes of, 637, 854.
congenital, 316.
epidemic of, 479.
hereditary and marriage, 240.
hysteric, 394, 477, 784, 852, 916.
mind, 317.
posthemorrhagic, 239.
prevention of, 76, 396, 560, 636.
psychic, **51,** (227), (522).
transitory, 158, 317, 915.
unilateral, **511.**
Blind spot, 715, 911, 912, 915.
Blood, circulation of, 157, 316, 716.
pressure, 316, 676.
staining of cornea, **564,** 783.
Blue scleras, 78, (821).
Book Notices—
Bethea, C. W., Practical Materia Medica and Prescription Writing, 845.
Bishop, E. S., Narcotic Drug Problem, 234.
Burrowes, A., What is it Like to Be Blind, 551.
Davison, H. P., American Red Cross in the Great War, 777.
Edridge-Green, F. W. Card Test for Color Blindness, 551.
Edridge-Green, F. W. Physiology of Vision with reference to Color Blindness, 845.
Fox, L. W., Practical Treatise on Opthalmology, 387.
Gjessing, H. G. A., Kliniske Linsestudier, 709.
Grimsdale and Brewerton, Opthalmic Operations, 906.
Hathway, W., Manual for Conservation of Vision Classes, 234.
Igersheimer, J., Syphilis and the Eye, **466.**
Kelly, H. A. and Burrage, W. A., American Medical Biographies, 846.
Kollner, H., Der Augenhintergrund bei Allgemeinerkrankungen, 777.
Lasso, J. de, Tractus de Conservatione Sanitatis Oculorum, 710.
Lewis, B., Medical Vademecum, 388.
Lewis, B., Vademecum for Otologists, 389.
Marie P. and Guillain, G., Travaux Neurologic de Guerre, 906.
Osler Memorial, Contributions to Medical and Biological Research, 302.
Pottenger, F. M., Symptoms of Visceral Disease in its Relation to Clinical Medicine, 388.
Roemer, P., Textbook of Ophthalmology, 471.
Schaeffer, J. P., The Nose, Paranasal Sinuses, Naso-lacrimal Passages and Olfactory Organ in Man, 232.
Sheard, C., Dynamic Skiametry and Methods of Testing Accommodation and Convergence of the Eyes, 470.
Swanzy, Handbook of Diseases of Eye and Their Treatment, 305.
Transactions, American Academy of Ophthalmology and Oto-Laryngology, 1919, 386; 469.
—— American Ophthalmological Society, 1919, 470.
—— College of Physicians of Philadelphia, 1918, 471.
—— Heidelberg Ophthalmological Society, 1916, 906.

—— Ophthalmic Section, Department of Public Health, Egypt, 1917, 233; 710.
—— Ophthalmological Society of United Kingdom, 1919, v. 39, 469; 305.
—— Pacific Coast Oto-Ophthalmological Society, 1919, 233.
—— Section on Ophthalmology, A. M. A., 1920, 387.
Wilbrand, H. and Saenger, A., Die Neurologie des Auges. VII Band. Der Erkrankungen der Sehbahn vom Tractus bis in den Cortex, 630.
Wood, C. A., American Encyclopedia and Dictionary of Ophthalmology, 468.
Wood, C. A., Andrews, A. H., Shambaugh, G. E., Eye, Ear, Nose and Throat, 388.
Botulism, 396, 560, 919.
Brain tumor, 79, 239, 394, 477, 638, 736, 852.
simulated, (458).
Brisseau, Michael, 786.
British Ophthalmologists, Council of, 155.
Brossage, 393.
Buphthalmos, **140**, 474.
Burns, 132, 158, (293), 393.
from salt of copper, **208.**
of conjunctiva, **256**, 395.
sulphuric acid, (822).

Cacodylat of soda, 237.
Calcium carbid, (226).
Calmette reaction, 395.
Canaliculus restoration of, **883.**
Cancer, treatment of, 159.
Cantharidin, 237.
Canthotomy, **685.**
Canthus anomaly, 852.
nevus of, (441).
Capsular extractions, 78, 282, 316, 476, (552), 714, **726**, 774, 851.
Capsule in cataract extraction, (212), (214).
of Tenon, tumor of, **210.**
Capsulotomy, 78, **284**, 851.
Carbon dioxid snow, 157.
Carcinoma of choroid, 716.
of lids, 159.
of orbit, **332.**
Carotid, ligation of, 239, 318, (624), 852, 915.
Cartilage of plica, 637.
Case records, **629.**
Cataract, absorption of (767).
and glaucoma, 316, **561.**
and myotonic dystrophy, 157.
and pregnancy, 851.
and syphilis, 394.
black, (60), 157, 238, 316.
blue dotted, (515).
congenital, 78, 238, 277, 476, (758), 914, 918.
diabetic, 393, 783.
experimental, (58).
family, 393, 783.
improvement in unoperated, **820**, (896).
iridotomy in immature, (515).
lamellar, 476.
morgagnian, (529), 851.
polar, 453.
radiuin in, **643.**
secondary, 157, 238, **280**, (289), 825.
senile, **178**, 316, 394, 476, 638, **739**, 785, 851.
soft, 557.
stellate, (225).
traumatic, 78, 393, **435**, 476, (546), 557, 638.
treatment of, 158, 316, **643**, 851.
zonular, 783.
Cataract extraction, 78, (212), (214), 238, **282**, (298), 316, (374), **386**, 393, 394, **476**, 546, **561**, 638, 714, **721**, **726**, 739, **741**, (774), 783, 786, **820**, 851, **902**, 914.
and hemorrhage, **23.**
anesthesia in, 238.
delirium, **741**, (889), **902.**
elevation of conjunctiva previous to, 714, 715.
fixation of globe in, 476.
infection after, (609).
intracapsular, 78, **282**, 316, 476, (552), 714, **774**, 851.
of traumatic cataract, (546).
paralysis of lids in, 476.
safety procedures in, **739**, (886).
subconjunctival, **275.**
suture of cornea in, 316.
with lance knife, (289).
Cauterization of tear sac, 239, 317.
Cavernous sinus, 79.
aneurysm of, **144.**
Cellulitis, (447).
Cereal grains, 6.
Cerebrospinal fever, 237, 319.
Certificate in ophthalmology, **74.**
Cervical sympathetic, 316, 396, (454).
extirpation of and iris, 783, (835).
Chalazion and refraction, 394.
Chemotherapy, 392.
Chiasm, alterations in, 79.
Chicago Ophthalmological Society, 138, 368. 442, 530, 611.
Chloral, action of on pupil, 850.
Chloraton paraffin, 475.
Choked disc, **1**, (379), 394, 852, 915.
Cholesteatoma, **134.**
Chondroepithelioma, (366).
Choroid, 476, 714.
atrophy of, 157, 476, 639, (828).
capillary layer of, 638.
circulation in, 914.
coloboma of, 97.
hernia of, 372.
ossification of, (535).
rupture of, 133.
sclerosis of, (297).
tubercle of, 393.
tuberculosis of, (557).
Choroiditis, (620).
central, 315.
disseminated, 476, 714.
Choroidoretinitis, (53), (62), 317, 557, 714, 715.
and communicating vessels, **499.**
Cilia in anterior chamber, **128**, **138.**
Ciliary body detachment, 316.
epithelium and ectopia, 714.
process in ulcer, 315.
Cinema and eye, 637, (845), 849, 851.
Clinics, 320, (552).
Coats' disease, 558.
Cobalt glass, (516).
Cocain, 77, 238.
poisoning, (527).
Colchicum, 913.

Collargol, 392.
College of Physicians of Philadelphia, 62, 219, 295, 379, 758, 824.
Collyria, 474.
Coloboma of choroid, **97**, 316, (380).
  eyeball, 79.
  iris, 97, (380), 476, 838.
  lens. 476.
  lids, 639.
  macula, (296), 316.
  optic nerve, 158, (366), 394.
  sclera, (372), 556.
Color blindness, 79, 158, 477, (551), 558, (845), 852, 854, 916.
  and Hering's apparatus, 317.
  and Young's hypothesis, 715.
  congenital, 79, 477.
  in fish, 784.
  in women, 784.
  matching in, 239.
  perception, 316, 639.
  sense, 158, 557, (772), **812**, 852.
  tests, (516), 639, 715, 784.
  vision, 79, 158, 239, 317, 396, 477, 558, 639, 715, 784, 852.
Colorado Ophthalmological Society, 66, 130, 373, 448, 535, 618, 821.
Commotio oculi, (542).
Comparative ophthalmology, 159, 396, 479, 558, 560, 640, 716, 783, 785, 853, 918.
Compensation for injury, 159, 230, **325**, (369), (373), 392, 396, (542), 560, 640.
Concussion, (225), 317, 318.
Congress, Colorado, 212, (868).
  Heidelberg, 906.
  International, 80, **384**, **549**.
  Oxford, 473.
Conical cornea, see Keratoconus.
Conjunctiva, 77, 157, 238, 315, 393, 475, 556, 637, 714, 783, 849, 913.
  actinomycosis of, 637.
  burns of, 256.
  chancre of, 157.
  gumma of, 238.
  papillary bodies in, 556.
  papilloma of, 637.
  neuroallergica, 714 (840).
  penicilium glaucum in, 556.
  sclerosis, 637.
  staining of, (527).
  tuberculosis of, **206**,, 315, 556.
  tumor of, 113, 240, 395, 478, 559, 683, 852.
Conjunctival coccidium, 637.
  hyperplastic tissue, **402**.
Conjunctivitis, 78, 393, 640, 913.
  blennorrhagic, 78, 913.
  cinema, (845), 849, 851.
  eczematous, 475.
  follicular, 238, 556.
  gonorrheal, 157, 315, (454), 475, 556, 637, (694), 783, 850, 913.
  granular 157, 393.
  Koch-Weeks, 783.
  Morax-Axenfeld, 315, 783.
  phlyctenular, (61), 157.
  scrofulous, 556, 714, 783, (840).
  self-inflicted, **601**, **858**.
  sporotrichosis, 393.
  streptococcic, (536).
  swimming bath, 913.
  vaccine, 475.
  vernal, **127**, **130**, 238, 475, (523), (541), 556, 637.
Conservation of vision, 80, (285), 319, 473, **479**, **688**.
  classes in, 234.
Contusion, (527), 716.
Convergence, (153), 782, 783.
  and accommodation, (289), (470).
  insufficiency of, **269**, (454), **878**.
Convex glasses and adaptation, 317.
Cornea, 78, 157, 238, 315, 475, 556, 637, 714, 783, 850, 913.
  action of methyl violet on, 637.
  bevel of, 157.
  blood staining of, **564**.
  conical, see Keratoconus.
  curvature of, 474.
  degeneration of, (532), 637, 827.
  enlarged in fish, (607).
  fibres in, 850.
  mole on, **818**.
  nutrition of, 315.
  papilloma of, **138**.
  rupture of, **787**.
  sensitiveness of, 556.
Corneal apoplexy, 157.
  atrophy, 637.
  dystrophy, 783, 850.
  herpes, 78, 158, 475, (540), (619), (687), **756**.
  microscope, 314, 538.
  limbus, (821).
  opacity, 315, 475, 637, (687), **717**, 850, 913.
  sclerosis, (541).
  staphyloma, 78, 913.
  staining, 315.
  tuberculosis, 133, 238, 850.
  ulcer, 238, 315, (540), 556, 637, 783, 850, 913.
Corneo-scleral, furrow, 315.
  margin, histology of, 78.
  trephining, (146), 238, 316, 557, 638, 914.
Correspondence, 72, 153, 306, 552, 708.
Council of British Ophthalmologists, 155.
Cranial injuries, eye symptoms, 158.
Crocodile, iris muscle, 783.
Crossed eyes, see Strabismus.
Cryptophthalmia, **684**.
Crystalline lens, 78, 157, 238, 316, 393, 476, 638, 714, 783, 851, 914.
  absorption of, (461), (767).
  clinical study of, (709).
  color changes in, 714.
  discission of, (526).
  dislocation of, 316, 476, (521), 638, 714, **783**, **914**.
  form of, 316.
  lamination of, 714.
  luxation of, 316.
  names of, 638.
  nucleus of, 476.
  opacity of, see Cataract.
  regeneration of in amphibiae, 784.
  sheath of, 78.
  weight, volume and ash of, 238.
  Vossius' ring on, 316, 914.
Cyanid of gold, 237.
Cyclodialysis, **41**, (64), 157, (458), 638
Cycloplegics, 392, 555, 716, 849.
Cyclops, 784, 852.

Cylinders, axis of, 77, (222).
Cyst, anterior chamber (448).
cornea, 240, 637.
iris, 78, 157, 238, 476, (687), 914.
lacrimal gland, (516), 916.
lids, 158, 318.
orbit 80, 318, (440), 478, 917.
sclera, 637, 914.
Cysticercus, 159, 395.
subretinal, 79, 917.
vitreous, (290), 395.
Cytologic studies, 918.

Dacryocystectomy, 317, 477.
Dacryocystitis, 79, 158, 715, 785, 852, 916.
rubber drain in, 317, (367).
chlorid of zinc in, 715.
Dacryocystorhinostomy, 558, 852.
Death, fundus after, **321.**
ophthalmoscopic signs of, (322).
Deaths:
Alt, A., 635, 778.
Antonelli, A., 780.
Arnold, J. D., 307.
Behrman, M., 235, 390.
Bjerrum, J., 780.
Bowles, F. J., 235.
Breaks, L. Z., 711
Callan, L W., 154, 631.
Campbell, J. F., 711.
Chacon, A., 390.
Church, B. F., 307.
Connell, E. J., 631.
Cook, W. D., 847.
Cowgill, W. M., 154, 307.
Eperon, S., 847.
Evershed, R., 390.
Ferguson, C. D., 780.
Goux, J. L., 75.
Hill, H. B., 554, 635.
Hollister, M. C., 154.
Holmes, C. R., 154, 307.
Johnson, J. J., 235.
Kyle, J. J., 847.
Lance, A. J., 154.
Lent, L. H., 154.
Lewin, W. C., 847.
Lindsey, E L., 390.
Linhart, C. P., 472.
McIntire, C., 309.
Marshall, J. P., 472
Morse, H. B., 711.
Montgomery, W. T., 390.
Musser, F. R., 311.
Norton, A. B., 311.
Nuel, J. P., 847.
Nunn, R., 780.
Pinckard, C. P., 154.
Pinkerton, J., 390.
Pitts, B., 390, 631.
Randolph, R. L., 75.
Reyling, F. T., 312, 390, 632.
Risley, S. D., 390, 632.
Robin, E. A., 711.
Rogers, W. K., 312, 390.
Russell, E. R., 75, 633.
Shorter, J. M., 235, 634.
Stowell, H. E., 312.
Spencer, J. H., 534.
Steinbach, J., 711.
Stubbs, G. H., 75.
Thiede, G. A., 312.
Valk, Frances, 634.
Vetsch, U., 847.
Whitney, E. M., 390.
Decompression, 477.
in glaucoma, 316, (363).
Delirium, **741,** (889), **902.**
Dental diseases, 80, 238, (452), 475, 479, 560, 639, 716, 860, (899), 917.
Dermatitis exfoliativa, **433.**
Dermoids, 318, (440), 478.
Detachment of ciliary body, 316.
of retina, (57), **143,** 158, 238, 239, 316, 317, 394, (437), 477, 558, 639, (696), (697), 714, 715, 784, 851, 912.
Deviation, conjugate, 393.
Diabetes, 474, (609), 720, 912.
and cataract, 393, 783.
and exophthalmos, 559.
Diagnosis, 77, 99, 157, 237, 314, 392, 474, 555. 637, 713, 782, **842,** 849, 911.
in glaucoma, 732, 783, **842.**
in scientific team work, 160.
Diathesis and glaucoma, 316.
Dichlorethylsulphid, **209,** 395, (543),
Dionin, **284.**
Dioptric measurements, 314.
Diphtheria, 853.
antitoxin, (536).
paralysis in, **747.**
Diploma in ophthalmology, 716.
Diplopia, 157, 237, 392, 555, 713, 912
binocular, **627.**
homonymous, 77.
Discission, (825).
Dislocation of eyeball, **814.**
of lens, 316, 393, 476, (521), 638, 714, 783, **914.**
Distance, estimation of, (705).
Drugs, action of on cornea, (540).
narcotic, 234.
Drusen of disc, (376).
Duboisin, 77.
Dynamics of extrinsic muscles, **878,** (892).
Dynamometer and blood pressure, 316.
Dysentery, 319, 395.

Ear and eye, 80, 396, 785, 849, 914.
nose and throat, relation to eye, **349,** (369).
Eclipse scotoma, 915.
Economics, 80, 159, 240, 320, 396, **434,** 479, 480, 640, 854.
Ectopia of lens, 714.
Ectropion, 158, 318, (612).
dermic graft in, **251.**
Eczema, 159, 913.
Editorials—
Academy Meeting, 904.
Adolf Alt, 626.
American Board for Ophthalmic Examinations, 71.
Base Line for Ocular Measurements, 54.
Binocular Discrimination of Distance, 765.
Cataract Operations, 386; 774.
Change in Refraction with Age, 228.
Condition of Ophthalmologists Abroad, 550.
Examination and Case Records, 629.

Glaucoma, 704.
Graded Examinations in Ophthalmology, 776.
Hole in Macula, 70.
Hospital Standardization, 547.
Insanity After Cataract Extraction, 902.
International Ophthalmological Congress, 384, 549.
Iris in the Newspapers, 152.
Methyl Alcohol Poisoning, 150.
Moorfield's Appeal, 708.
Moving Picture Ophthalmia, 844.
National Meetings, 230.
Neglected Opportunity, 842.
New Journal, 466.
New Orleans Meeting, 465.
Protective Glasses, 707.
Publication Resumed, 231.
Reports of Rare Pathologic Conditions, 464.
Relation of Ophthalmologists to Dispensing Opticians, 300.
Rights to Collect for Services, 903.
Special Qualifications in Ophthalmology, 153.
Study of Binocular Diplopia, 627.
Study of Local Anesthetics, 299.
Suspended Journals, 550.
Tests for Poor Vision, 843.
The Journal Year, 905.
Volume Three, 68.
Waste of Energy in Ophthalmology, 69.
Which are our Best Papers, 302.
Education, 80, 160, 240, 320, 396, 473, 480, 560, 640, 716, 786, 854.
and eyesight, 319, 479.
in ocular physiology, (625).
ophthalmic school in India, 480.
Egyptian Ophthalmological Society, 233, 320.
Electrolysis, 476.
Elliot operation, (146), 157, 238, 316, (364), 557, 638.
Embolism, retinal, 158, (224), 239, 477, **513.**
Emetin, 240, (623), 850.
Encephalitis lethargica, 80, 159, 237, 240, 319, (373), 395, 475, 479, (530), **560, 587,** (619), 637, 640, 716, 784, 785, 849, 853, 912, 918.
Encyclopedia of ophthalmology, 468.
Endarteritis, (295).
Endrocrin organs, 394, 853, 918.
Endophlebitis and retinal hemorrhage, **111.**
Endophthalmometer, 849.
Endothelioma, 318.
of lid, 395.
Endospermin, (835).
Enucleation, **134,** 316, 477. **497,** (611), 784, 916.
method of, **166.**
Epinephrin, 556, 667, 914.
Epiphora, 477.
Epistaxis, 474.
Epithelial dystrophy, (540).
Epithelioma, 80, 395.
of conjunctiva, **113, 683.**
of lid, 559, **602.**
of orbit, 559.
Ergograph, 393.
Erisiphake, (356), **714, 721,** 723, (770), 851.
Erythema, 850.
Erythropsia, 558.
Eserin, 237, 238, 911.
Esophoria, 882.
Ethmoid mucocele of, (383).
Ethmoiditis, 80.
Ethylhydrocuprein, **360,** 911.
Eugenics, 479.
Evisceration, (611).
Evulsion of optic nerve, 318.
Examinations, 71, 74, **153,** 553, 629, 716, 776.
Exophoria, 117, 782, 783.
Exophthalmic goiter, 79, 239, 478, 559, 649, 852, 916, 917.
Exophthalmos, (62), 79, 395, (535), 559, (624), 639, 852.
pulsating, 159, 318, (437), 478, **605,** 917.
Eye, artificial, 394, 395, 478, (612).
color of, 157, 918.
formation of, 317.
lash, 239, 640.
symmetry of, 317, 319.
Eyeball, 79, 239, 317, 477, 558, 639, 784, 852, 916.
in injury, 558.
luxation of, **814,** 916.
ossification of, 239.
perforation of, 640.
Eyestrain, 77, 157, 314, 474, 479, 637, (700), 782.
of artists, 77.
Facial paralysis, (776), 912.
Fees, right to collect, **903.**
Fever and ocular complications, 479.
spotted and optic neuritis, 317.
Fibrolysin in glaucoma, 851.
Field of vision, **49, 51,** 79, (620), 639, 784.
in brain tumor, **736.**
in injury, 558.
in maniacs, 849.
tubular, 158.
Field glasses, 713.
Filaria loa, 79, (146), (617), 917.
Finsen light therapy, 237.
Fish, color blindness of, 784.
enlarged cornea in, (607), 918.
lengthening of eyeball in, 854.
Fistula of lid, 158.
Flap, conjunctival, 393.
Flavin, 849.
Flies and trachoma, 393.
Flounder, migration of eye in, 479.
Fluorescent rays, 911.
Focal infection, 33, 80, 157, 159, (226), 238, 315, 476, (828), 850, **860.**
Folliculosis, 913.
Foreign bodies, 80, 159, 240, 325, 395, (440), 479, 639, 640, **648,** 716, 785, 853 917.
localization of, 72, 80, 159, 240, 318, 319, (703), 716, 785, 853.
magnetic, (291), 395, 478, 559.
removal of, **118, 137,** 318, 319, **325,** 395, 559, 560, 640, 716, (823), 917.
Fornicoplasty, 395.
Fovea of birds, 240.
Foveal vision, 784.
Fox, H. A., 232.
Fracture of skull, 79.
Fragilitas ossium, 78, 315, (821).

Fundus anomalies, **161**, (217).
after death, **321**.
and general disease, 555, (777).
before death, 477.
photography of, 77.
Fungus in canaliculi, 239, **327**.
Furuncle, lacrimal, 852.
Fusion, 713.

Gas, asphyxiating, **323**, 395, 475, 478, 583, 715.
mantles, **24**.
Gasserian ganglion, 315.
General diseases, 80, 159, 240, 319, 395, **479**, 555, 560, 640, 716, 785, 853, 918.
practitioner and ophthalmology, **80**, 160, 238, 480.
Genital organs and eye, (840).
Gerontoxon, (542), 783.
Glasses, see Lenses.
Glaucoma, 78, 157, 238, 316, 393, (448), (453), (460), 476, (515), 557, 638, **678**, **704**, 714, (769), 783, 850, 914.
and cataract, 316, **561**.
and detachment of retina, 714.
and myopia, 393, 851.
and syphilis, 476.
aniridia in, 714.
chronic, 238, (363), **816**, 851, 914.
congestive, (444).
cyclodialysis in, **41**, (64), 157.
etiology of, **673**, 851.
diagnosis of, **732**, 783, **842**.
following homatropin, (367).
inflammatory, 393.
iodin in, **341**.
juvenile, 140, **474**, 557.
nonoperative treatment of, (608).
operations, 78, 157, 393, 476, 557, (624), 638, 851, **914**.
secondary, 638.
simplex, (535).
thermophore studies in, 914.
tonometry in, 237, 474, 476, 557, **669**.
traumatic, 361.
Glioma of ciliary processes, 395.
retinal, 318, 395, 716, **806**, **869**, 852, 917.
Gliosis and meningoencephalocele, 478.
Glycosuria, 393.
Goggles, 479.
Goiter, 79, 239, 478, 559, 649, 852.
Gonorrhea, (61), 157, 315, (454), **475**, 556, 637, (694), 783, 850, 913.
Goundou in Mexico 853.
Gradenigo syndrome, 237, 912.
Grafts, 158, 256, 394, 475, 637, 916.
dermic for ectropion, **251**.
mucous, (293).
Granuloma, 159.
Meibomian, (373).
of iris, **135**.
Grippe, 157, 317, 395, 785.
orbital inflammation in, 785.
See also Influenza.
Gullstrand lamp, 237, (365), 555, 556, 714, 782, (835).
Gumma, 238, 853, 914.
Head surgery, (285), 640.
Headache, 159, 237, 314, 637, 782.
Heat therapy, 77, 238, 314, 783.
Hematoma, 240.
Hemeralopia, **162**, 477, 558, 715, 784, 851, 915.
after optochin, 158.
false, 158, 239.
Hemianopsia, **51**, 317, 477, 574.
after brain injury, 852.
homonymous, 158, 317, 477.
Hemiplegia, 849.
Hemiatrophy of face, (362).
Hemicrania, 80.
Hemorrhage and blindness, 158.
and venesection, **23**.
retinal, 78, **111**, 477, 558, (624), **652**, **657**, 851.
vitreous, (224), 238, 640.
Heredity, 157, 159, 238, 241, 319, 394, 395, 477, 478, 479, 560, 639, 850, 918.
and cataract, 393, 783, 918.
and pigmentation of lids, **874**.
Hernia of choroid, (372).
of vitreous, 914, 915.
Herpes zoster, 78, 158, 475, (540), (619), (687), **756**, 913.
experimental, 716, (769), 850.
Heterochromia, 556, 557, 838, 850, **874**.
Heterophthalmia, 238.
Heterophoria, 157, **201**, (517), 556, 713, 782.
and sighting eye, **258**.
Heteroplasty, 79.
orbital, 478.
Heterotropia, **201**.
See Strabismus.
Hetol, 78.
High frequency current, 314.
Histology of conjunctiva, 238.
of senile eye, (839).
History, 80, 135, 160, 240, 320, 396, 560, 640, 786, 854.
Hole in macula, **70**, **133**, (224), 477, 558, **605**, **884**.
Homatropin and glaucoma, (367).
poison, (823).
Hospitals, eye work in, 240, 479, 854.
for blind, 320.
Royal London (Moorfields), **708**, (781).
Scottish, 480.
standardization of, **547**.
Hutchinson teeth, 315.
Hyaloid artery, (534), 557, 715.
canal, 316, 474.
membrane, **280**.
vessels, (377).
Hydatid cyst of brain, 158.
Hydrophthalmos, 238, 557, 838.
Hygiene, 80, 159, 240, 319, 396, 473, 479, 560, 716, 785, 854.
Hyperkeratosis, 478.
Hyperopia, (620), 713, 782.
and diabetes, 474.
Hyperphoria, 882.
Hypertony, 639.
Hypophysin and pupil, 315.
Hypophysis, 158, 239, 558, 784, 852, 916.
Hypotony, **87**, (219).
Hysteria, (61), 237, 477, 784, 850.

Idiocy, amaurotic, 239, 316, 477.
Illiterate, test type for, **5**.

Illumination, **24**, 80, 237, 392, 555, (621), 716, (770), (772), 849, 911.
artificial, 80, 716.
low and visual acuity, **335**.
of mines and nystagmus, 392.
scale of, **408**.
Implantation, fat, (620).
gold ball, (824).
paraffin, (613).
Industrial injuries, 80, (226), **325**, **434**, 480, (542), 560.
Infection after cataract extraction, (609).
after trephining, 316.
bacillus subtilis, 393.
eye as portal of, 238.
focal, 33, 80, 157, 159, (226), 238, 315, 476, (828), 850, **860**.
Inferior oblique, spasm of, (59).
Influenza, 80, 157, 476, 784, 785, 849, 853, 855.
and retinal hemorrhage, 78.
and thrombosis of vein, **855**.
Injections, iodin, 158.
milk, (58), 77, 157, 474, 849, 911.
See parenteral.
subconjunctival, 237, 475, 637, **884**.
Injuries, 80, 159, 240, 318, 393, 395, (449), 478, 558, 559, 640, 716, 785, 852, 917.
concussion, (225), 317, 318.
contusion, (225), 317, 318.
gas, **323**, 395, 475, 478, 583, 715, 917.
from acids, (822).
from arrow, 480.
from bean shooter, (378).
from cilia, **128**, **138**.
from chestnut burr, (366), 479.
from copper, (377), 478, 479.
from explosion, 395, (538).
from fork, 318, 640, (768).
from glass, 716.
from ink, 159.
from light, **178**.
from lime, 80.
from nail, (67), 479.
from nickel splinter, 319.
from salt of copper, **208**.
from steel, **137**, 478, (821).
from tennis ball, (224).
from wood, 559.
from X-ray, 240.
indirect, 640.
industrial, 80, (226), **325**, **434**, 480, (542), 560.
penetrating, **132**, 159, (451), 478, 560, (703), 716.
perforating, 159, (516), 559, 716.
self-inflicted, 237, 392, 601, 858.
to centers, **51**, 317.
to choroid, **133**, 318, 559, 640.
to ciliary body, 395, 478, **805**.
to conjunctiva, 395.
to cornea, 80, 318, (366), 395, 478, 559, 640, **787**.
to eyeball, (66), **814**, 853.
to iris, 853.
to lens, 478, 479, 559, (821).
to lids, 478, 917.
to muscles, 361.
to optic nerve, (53), 317, 318, 559.
to orbit, 362, 478, 559.
to pupil, (378), 650.
to retina, 318, 478, 559.
to sclera, (62), (67), 240, 318, **805**.
to trochlea, 80.
to vitreous, (291), 395, 559.
Insanity after cataract extraction, **902**.
Instruments, 237, 314, **359**, (381), **755**, 911.
dioptric, 314.
optical, 637.
Intoxication, gastric, 77.
Intracapsular extraction, see catarrhal extraction.
Intraocular pressure, 157.
Intracranial lesions, 555.
Iodin, 158, 237, 315, 637, 849.
in glaucoma, **341**.
Iontophoresis, 474.
Iridectomy, 78, 238, (618).
for glaucoma, (453), **638**, **914**.
Iridochoroiditis, 476, 638, 639, 715.
Iridocyclitis, 316, (377), (379).
Iridodialysis, **357**, 716, 850.
Iridodonesis, (453).
Iridoplegia, **748**.
Iridotomy, 392, (515).
Iris, (151), 714, 783, 914.
anatomy of, 850.
changes in, **493**.
coloboma of, 97, 850.
colorless, 476.
cyst of, 78.
depigmentation, 78, 238.
granuloma of, **135**.
muscle, 783.
of dog, 557, 783.
neoplastic degeneration of, (827).
new formed vessels in, (437).
prolapse of, (516), 716.
Iritis, 315, 316, 393, (452), 476, 556, 557, 714, 783, (885), 914.
glaucomatous, 157, 393, (448), (618).
gonorrheal, (438).
recurrent, (66), **432**, (618).
rheumatic, 315.
syphilitic, 78, 157, 315.
treatment with protein, **93**.
Irrigation, 316.
Itrol, 475.

Jaundice, 474.
Journal of Physiologic Optics, (466).
Juvenile cataract, 78, 238, **277**, 476, (758).
glaucoma, 140, 474, 557.

Kaposi's disease, 318.
Keratalgia, (542).
Keratitis, 78, **143**, 238, 393, 475, (539), 637, 714, 850, 913.
alphabet, 913.
disciformis, 475, (542).
dumbell, 157.
eczematous, 159, 913.
from wasp sting, **493**.
furrow, (688).
harvesters', 315.
hypopyon, (65), 78, 157.
interstitial, see parenchymatous.
macular, 157.
neuroparalytic, 238, **354**, 850, 913.
nodular, 315.
parenchymatous, 78, 315, 475, (541), 637, (701), 783, 913.
peripheral, (528).

phlyctenular, 315, (540), 850.
profunda, 556.
punctate, (688).
reticular, **717.**
sclerotic, 913.
scrofulous, 556.
tuberculous, 850.
Keratoconjunctivitis, **209,** (540).
Keratoconus, 315, 393, 475, 637, 913.
and vernal conjunctivitis, **127.**
operation for, **429,** (459).
Keratoiritis, (374).
Keratomalacia, 78.
Keratoplasty, 475.
Knife, cataract, 713.
Krönlein operation, 639, **789,** 852.

Labyrinth, 77, 314, 784.
Lacrimal apparatus, 79, 158, 239, 317, 394, 477, 558, 639, 715, 785, 852, 916.
canaliculi 239, 317, 916.
duct, atresia of, **406.**
furuncle, 639.
gland, and carcinoma, **332.**
secretion, 393, **802.**
Lacrimal sac, 79, 317, 639, 852, 916.
compression muscle of, 785.
draining of, (219).
excision of, (221).
extirpation of, 239, 477, 559, 715.
fistula of, (697).
incision of, **206.**
lupus of, 852.
Lactic acid in vitreous, 78.
Lagophthalmos, 158, (542).
Lamp, Gullstrand, 237, (365).
Lance knife, (298).
Lantern, color sense, 916.
for testing light sense, **335.**
Larva, 477.
Lead poisoning, (886).
Leber's disease, 915.
Lenses, bifocal cataract, 912.
colored, 785.
decentering of, 912.
history of, 786.
punctal, 782.
protective, 159, 396, **688,** (707), 716, 785.
sun, 716.
toric, **686.**
Lenticonus, 239.
Leptothrix on conjunctiva, 913.
Lethargic encephalitis, See Encephalitis.
Leucoma, 475.
Leucosis retinae, **109, 306.**
Lids, 79, 158, 239, 318, 394, 478, 559, 639, 715, 785, 852, 916.
and ear reflex 785, 852.
coloboma of, 639.
edema of, 916.
horn of, (688), 852.
fistula of, 158.
operations on, 79, 158, 318, 394, (463), 559, 639, 715, 785, 852.
ulcer of, (377).
vaccination of, **103.**
Liebreich's ophthalmoscope, (135).
Light, composition of, 24.
therapy, 911.
Lime and eczema, 159.
Lipoma, 395.
Little's disease, 560, 918.
Liver and astigmatism, (455).
Localization, of foreign bodies, **72,** 80, 159, 240, 318, 319, 716, 785, 853.
of images, 715, 912.
Locomotor ataxia, 159.
Lues, 240, 319, 477, 479, 638, 918.
Lumbar puncture, 394.
Lupus of lacrimal sac, 852.
Luxation of eyeball, 319, **814.**
of lens, 316, 476, (521), 638, 714, 783.
Lymphadenoma, 640.
Lymphoma, 395.
Lymphosarcoma, 210.

Macrolentis, **675.**
Macula changes in, (54).
degeneration of, **178,** 241, 558, 915,
hole in, **70, 133,** (224), 477, 558, **605, 884.**
Maddox rod, 555, 556.
Magnet extraction, (823).
Malaria, 479, 849.
Maniacs, 849.
Marriage and hereditary blindness, 240.
Massage in embolism, **513.**
Masseurs, 319, 320, 396, 480.
Mastoid disease, 394.
Measles, 316.
Medico-legal, 80, 786, **805,** 854.
Meibomian glands, 849.
Megalocornea, 238, 556, (608), 783.
Melanoma, 872.
Melanosarcoma, 478, 836.
Meningitis, 79, 555, 915, 917.
Mercurochrome, 220, 475.
Mercurophen, (765).
Mesopotamia eye work in, 240.
Metabolism, and glaucoma, 677.
Metastatic ophthalmia, 475, 852, 913.
Methylen blue, 911.
Methyl violet, 637.
Microcornea, (608), **675.**
Microphthalmos, 79.
Microscope, corneal, 314, 637.
Microscopic examination, 395, 637.
of living eye, (538), (835), 911.
in endophlebitis, **111.**
of orbital abscess, **876.**
Middlemore, R., 240.
Migrain, 782, 852, 912.
Mikulicz' disease, 559, (624), 639, 785, **852,** 916.
Military service, (885).
Miotics, and glaucoma, 557.
Mnemonics, 77.
Mole, pigmented of cornea, **818.**
Mongolian idiocy, 394, 639.
Moorfields Eye Hospital, **708,** (781).
Motor drivers, one eyed, 786.
vision of, 157.
Mucocele, (383), 395, 478.
Muscular balance, 77, **136, 878,** (892).
Myasthenia, 79, **747.**
Mydriasis, 238, 556, 716, (823), 911, 914.

Myopia, 314, 474, 637, 713, 912.
and discission of lens, (526).
etiology of, 314.
high, 237, 849, 850, 851.
progressive, 129, 555.
school, 80.
Myotonia dystrophy, 157.

Naphthol camphor oxid, 238, (623).
Nasal disease, 170, 195, 232, 319, 395, 560.
Nela research laboratories, 712.
Nernst lamp, 316, 911.
Nervous disease and the eye, 240, 640.
Neuralgia, 560, 918.
Neurasthenia, (620), 782.
Neurobiotaxis, 79.
Neuroblastoma, 318.
Neurofibromatosis, (686).
Neuroretinitis, 317.
syphilitic, 1, 131, 915.
Neuroses, 556.
Nevus, (441).
News items, 75, 154, 235, 312, 391, 472, 554, 635, 780, 847, 909.
Nocardiasis, 478.
Novarsenobenzol, 638.
Nutrition, and eye disease, 716, 784.
Nystagmus, 77, 157, (515), (620), 637, 849, 912.
and twilight vision, 162.
caloric, 314.
cerebral, 555, 912.
latent, 555.
miners', 237, 315, (368), 392, 393, 475, 556, 854, 912.
occupational, 237, 396.

Occlusion monocular, 393.
of artery, (295).
Ocular movements, 77, (148), 157, 237, 314, 392, 475, 555, 637, 713, 782, 849, 912.
and attention, 77.
Ocular muscles, imbalance of, 136, 237, 878.
operations on, 116.
Ocular measurements, 484.
physiology, institute for, (625).
Oculocardiac reflex, 319, 479, 638, 785, 849, 853, 918.
Ointment, Singleton's, 157.
Operations, 77, 157, 314, 392, 474, 636, 637, 713, 782, 849, 906, 911.
and delirium, 741.
glaucoma, 78, 157, 393, 476, 557, (624), 638, 851.
Krönlein, 639, 789, 852.
lacrimal, 239, 477, 559, 715.
lids, 79, 251, 715.
muscles, 116, 237, 314, 393, (457), 755.
orbit, 144, 239, 318, 559.
plastic, 55, 79, 239, 318, 478, (612), 785.
socket, 55, 555.
Toti's, 477.
Zeeman's, 916.
Ophthalmia, electric, (226).
gonorrheal, (61), (475).
metastatic, (475), 852.
neonatorum, 78, 140, 315, 475, (610), (781).
moving pictures, (637), 845.
phlyctenular, (61).
Ophthalmic education, 121, 240, 302, 640, 716.
examinations, 71, 74, 153, 553, 716, 776.
journals, suspension of, 550, 554.
physicians, (55), (144), 240, (294).
qualifications, (151).
service in army of occupation, 343, 427.
training, (606).
Ophthalmodynamometer, 475.
Ophthalmological Congress, Colorado, 212, (868).
Ophthalmological societies, 76, 130.
American, 295, 470.
American Academy of Ophthalmology and Oto-Laryngology, 454, 469, 905.
Australasian Medical Congress, 885.
Baltimore, 136, 224.
Belgian, 361, 471.
Chicago, 138, 368, 530, 611.
Colorado, 66, 130, 373, 448, 535, 618, 821.
Heidelberg, 906.
Oxford, 473.
Pacific Coast, 233.
Pittsburgh, 59, 440.
Minnesota, 373.
New York Academy of Medicine, 828
St. Louis, 517.
Section, A. M. A., 229, 387, 465, 687.
Section, College of Physicians, Philadelphia, 62, 219, 295, 379, 471, 521, 758, 824.
Section, Royal Society of Medicine, 53, 143, 437, 514, 687.
Swiss, 57.
United Kingdom, 305, 606.
International, 80, 384, 549.
Oxford, 473.
Ophthalmologists, condition of abroad, 550.
Council of British, 479, 636.
Ophthalmology, advancement of, 80.
and Master of Surgery, 480.
certificates in, 74, 553.
diploma, 160.
encyclopedia of, (468).
in Paris, 396.
in Syria, 396.
standardization of, 52, 160.
text book of, (Roemer), (471).
unfit in, 320.
waste of energy in, 69.
Ophthalmomyiasis, 395, 639, 917.
Opthalmoplegia, (62), 77, 237, 315, 475, 555, 637, 713, 749, 849, 912.
Ophthalmoscope, electric, 157, 474.
Liebriech's, 135.
Ophthalmoscopy, 237, 314, 316, 474, (538), 555, (621), 637, 782, 911.
Ophthalmotomy, (624), 851
Optical imperfections, their use, 865, (895).
iridectomy, 618.
rhythm, 239, 315.
Opticians, 300, 480.
in Australia, 80, 885.
Optic disc avulsion of, (54), (62), 558.
choked, 715, 784.
cupping of, 680.
hole in, 361, (380).
Optic nerve, 79, 158, 239, 317, 394, 477, 558, 639, 715, 784, 852, 915.
atrophy, 447, 558, 639, 915.
avulsion of, (54), (62).
coloboma of, 158, 394, 558.
injury to, (53), 317, 318, 559.
pathology of, 639.

structure of, 852.
tubercle of, 784.
tumor of, (53), 159, 240, **665**, 852.
Optic neuritis, (62), 158, 239, 317, 394, 477, (534), 558, 639, 715, 784, 851, 852, (886).
treatment of, 715, 852.
Optics, (466), 474, 637, 713, 912.
Optochin, 158, 317, (768).
Optometry, see Opticians.
Orbit, 79, 159, 239, 318, 395, 478, 480, 559, 639, 715, 716, 785, 852, 917.
and cleft face, 395.
carcinoma of, **332.**
configuration of, 159.
dilatation of, (149), 318.
dimensions of, 79, 639.
muscle of, (701).
restoration of, **144**, 239, 318, 559.
tumors of, 80, 134, 157, 210, 240, 318, 332, 395, 559, 640, 785, 852.
Orbital abscess, 395, **876.**
actinomycosis, 715.
anaplerosis, 318.
aneurysm, 239, 853.
cellulitis, 917.
cyst, 80, 318, (440), 478, 917.
hemorrhage, 478.
periostitis, (296).
phlegmon, 639, 785, 917.
prothesis, 239.
thrombosis, 318, 853.
varicocele, 159, 318, (361).
Orbitoplasty, 395, 785.
Orbitotomy, 917.
Orientation, 713.
Osler, Anniversary Volume, **302.**
Osmosis electric, 716.
Ossification, 239.
Osteomata, 785.
Osteomyelitis, 918.
Osteoperiostitis, 395, 478.
Otitis media and paralysis, (766).
Oxycephaly, 558, 559, 715.

Painting and the eye, 480.
Japanese and spectacles, 640.
technic of, 786.
Pancreatic insufficiency and pupil, 556.
Panophthalmitis, **132**, 317, 639.
Papilla, drusen of, (376).
Papillary stasis and tumor, (545), 784.
Papilledema, **1**, 158.
Papillitis, 239.
Papilloma, 318.
of cornea, **138.**
Paracentesis of cornea, **48**, 911.
of vitreous, 911.
Paraffin, (613).
Parffinoma, 715.
Paralysis, 157, 237, 314, 475, 713, (822).
after injury, 637, 912.
and high myopia, 314.
and pregnancy, 782.
juvenile with gummata, 853.
of sixth nerve, (766).
postdiphtheritic, **747.**
sudden recovery of, (375).
Paraplegia, 477.
Parasites, 79, (146), 159, 239, 318, 395, 478, 639, 784, 917.
Parenteral injections, (58), 77, 392, 396, 475, 714, 911.
Parkinson's disease, 912.
Paropsia, 394.
Pathology, 159, 240, 319, 395, (464), **479**, 560, 639, 640, 716, 853, 918.
of senile eyes, 785, (839).
Pectinate ligament, **675, 680.**
Pemphigus, 507, (523).
Pensions for blind, 716.
Perception of distance, 851.
Perimetric chart, **49.**
methods of study, 392, 911.
Perimetry, 158, 474, (524), **584**, 782, 911, 912.
color test in, 713, 784.
Perithelioma of lid, (687).
Periostitis, (296).
Petit mal, and glasses, (65).
Phakoerisis, (366), 714, **721**, (770).
Phlyctenulosis necrotic, 714, 783.
Photoelectric cells and the eye, 394, (544), 639,
reaction, 79, 639.
Photography, 77.
Photophobia, 239.
Phototherapy, 474.
Photoperception, 784.
Physiology of seeing, 316, **865.**
Pigmentation, **109**, 316, 639, 784, **874.**
Pituitary disease, **135, 571.**
Plastic operations, (55), 79, 239, 318, 478, (612), 785.
Pneumonia and orbital phlegmon, 784.
Polioencephalitis, 853.
Polycoria, 475, 638.
Polycythemia, 560, 716.
Polyneuritis, 240.
Poultices, 392.
Pregnancy, 158, 239, 477, (536), 639, 782.
Presbyopia, 314, 392, 637.
Prevention of blindness, 76, 396, 560, 636.
Printing, optical aspects of, 80.
Priority in transillumination, 640.
Prism, 555.
meter measure, **755.**
Probes, 559.
Proboscis, 239.
Proptosis, **139**, 478.
Protective glasses, 159, 396, **688**, (707), 716, 785.
Protein, function of, **802.**
therapy, **93**, 237.
Prothesis, **134**, (149), 239, (463), 478, (612).
gold ball, **497**, 558, (824).
oculopalpebral, 79.
Pseudosyndrome, (383).
Psychic blepharospasm, 715.
Psychology and the eyes, 240, 784.
Pterygium, 393, 850, 913.
Ptosis, 79, 158, 318, 394, (457), (624), 639, (824).
hysteric, (61).
Pupil, 78, 157, 238, 315, 475, 556, 637, 714, 783, 850, 914.
Argyll-Robertson, (147), 157, 475.
artificial, 315.
changes in, 157, 637, 914.
double, 480.
examination of, 81.

immobility of, (768), 783.
inequality of, 315, 475, 714, 850.
irregularity of in syphilis, (835).
occlusion of, 637.
reflexes, 315, 475, 714, 850.
rigidity, 714.
shape of in animals, 157.
sphincter, 476.
Pupillary distance, 77, **490**, 911, 914.
membrane, (295), (377), 475, 637, 837.
Pupillometer, (381).
Purtscher's method of trephining, (443).
Pyoktanin, 77.

Quinin, 158, 317, 477, 558, 639, (841).

Radiant energy, 240.
Radiography, 914.
Radiotherapy, 237, 395, 396, 475, 640, 911.
Radium, 79, 80, 238, 240, 243, 318, 555, 558.
in cataract, 392, **643**.
in retinal glioma, **806, 872**, 917.
Railway employes, 320, 480.
Records, day-book and ledger, (381).
Red Cross in War, (777).
Refraction, 77, 157, **197**, (215), 237, 314, 392, 394, 474, 555, 637, (697), 713, 782, 849, 911.
and fitting glasses, **481**.
changes with age, **228**.
detection of small errors, **408**.
objective findings in, **597**.
Refractive media, 783.
Retina, 78, 158, 238, 316, 394, 476, 477, 557, 558, 638, 715, 784, 851, 915.
circinate degeneration of, 158, 558.
circulation in, 238, 316, 477.
fatigue, 915.
folds, 317, (477).
pigmentation of, 109, 316, 639, 784.
regeneration of, (149).
rupture of, (225), 715.
sensitiveness of, 784, 915.
syphilis of, 638.
Retinal adaptation, 158, 638, 639, 715, 784.
aneurysm, **641**.
arteries, **48**, 158, (452), **641**, (762).
detachment, 57, **143**, 158, 238, 239, 316, 317, 394, (437), 477, 558, 639, (696), (697), 714, 715, 784, 851, 912.
embolism, 158, (224), 239, 477, 556.
hemorrhage, 78, **111**, 477, 558, (624), 652, **657**, 851.
images, 79, 158, 316.
rods and pigment, 316.
scotoma, 316, 915.
phlebitis, 857.
space sense, 394.
stimulation, 477, 715.
tension, 477, 715.
thrombosis, (451), 558, **855**.
vessels, 158, 239, 477, **499**, 715, **818**.
and atmospheric pressure, 158.
and choroidal vessels, **499, 818**.
anomaly of, **161**.
Retinitis, 715, 851, 915.
albuminuric 239, 851.
disciformis, **605, 884**.
exudative, 558, 915.
hemorrhagic, (226), 238.
nephritic, 394.
pigmentosa, (67), 158, (225), 316, 394.
proliferans, (296), 316, (371), 477, 558, 851.
punctate, (225).
septic, 639.
syphilitic, 638.
Retinochoroiditis juxapapillaris, 157.
Retinoscopy, **755**.
Retrobulbar neuritis, **355**, 784.
Rheumatism, 315, 918.
Rodent ulcer, 238, 315.
Roentgen ray therapy, 159, (226), 395, 558.
Royal London Ophthalmic Hospital, **708**, (781).
Rupture of choroid, **133**, 318, 640.
of glaucomatous eye, 557.
of Morgagnian cataract, 851.
of retina, (225), 715.
of sclera, 240, 318.

Salvarsan, 78, 319, 477, 479.
Sarcoma, 79, 559, 917.
intraocular, **732**.
of choroid, 79, 395, 640, 716, 852.
of ciliary body, 318.
of cornea, 640.
of iris, 240.
of lid, 318, 395.
of oculomotor nerves, 852.
of orbit, 318.
of sclero-corneal junction, (534).
School conjunctivitis, 637.
examination, 716.
for blind, 786.
trachoma, 240.
Sclera, 78, 157, 238, 315, 475, 556, 637, 714, 783, (821), 850, 913.
blue, 78, 157, 315.
coloboma of, 556.
foreign body in, (63).
staphyloma of, 131.
Sclerectomy, 316, 476, 557.
Sclerectoiridectomy, 714.
Sclero-corneal trephining, (146), 238, 316, 557, 638.
Sclerosis of choroid, (297).
of conjunctiva, 637.
Scotoma, 238.
and refraction, 555.
ring, 316, 317.
Scotometer, (886).
Scrofula, 238, 479, 556, 783, (840), 850, 913.
Scurvy, 915.
Serology clinical, 157.
Serum therapy, 78, 638, 713.
Shot wounds, (62), 159, 317, (438), 559, 784, **787**, 852, 952, 917.
Siderosis bulbi, **141**, 319, (542), (617), 785, 838, 853.
Sighting eye, 77.
Simulation, 237, 392, **601, 858**.
Sinus disease, 239, 318, 479, 784, 785, 852.
and blindness, 396, 852, 915.
Skeletal symmetry, 319.
Skiametry, 77, (470), 782.
Small-pox, 479.
Smith-Indian operation, 78, **282**, 476, (552), 714, **774**, 851.
Society Proceedings, see ophthalmological.

Sociology, 80, 159, 240, 319, 473, 479, 560, 640, 716, 785, 854, 918.
Sockets, contracted, 318.
  restoration of, (55), 785.
Sodium chlorid, 637.
Soldiers, visual examination of, **72.**
Spectacles failure to provide, 80.
  fitting of, 157, **481.**
  history of, 640, 839.
  profiteering in, 786.
Spectrum, 783.
Speculum, **603.**
Spirochetosis icterohemorrhagica, 240.
Sporotrichosis, 319, 393.
Sprays, 392.
Squint, see Strabismus.
Staining, corneal, 78.
Standards of vision, 854.
Staphyloma of cornea, 78.
  of sclera, 131.
Stereomicrometer, **417.**
Stereoscope, 77.
Stereoscopic training, (153).
  vision, 314.
Stereopsis, 237.
Stomach and eyes, 853.
Strabismus, 77, 237, 314, 315, 318, (441), 475, 555, (620), 713, 782, 912.
  and colored glasses, 556.
  crown suture in, 849.
Streptothricosis, **327.**
Strychnin, 639.
Subconjunctival injections, 237, 475, 637. **884.**
Subconjunctivitis hyperplastic, **402.**
Sulfarsenol, 849.
Sulphuric acid burn, (822).
Superior rectus, paralysis of, (59).
Suture of cornea in cataract extraction, 316, 911.
Symblepharon, **132,** 158, (293), 393.
Sympathetic disease, 78, 157, 316, 393, 476, 497, 557, 714, 783, 850, 914.
  system and pupil, 315.
Syndrome, Claude Bernard-Horner, 79.
  Gradenigo, 912.
  Marcus Gunn, (463).
  Mikulicz, 559, 624, 639, 785, 852.
  Webér, 77.
Synechia of cornea, 319, (450).
Synechiotome, 314, (545).
Synophthalmia, 558.
Syphilis, 78, 80, **131,** 157, 238, 319, 396, (466), 476, 479, 637, 639, 714, 716, (835), 850, 853, 913, 914, 915, 918.
  and cataract, 394.
  and typhus, 159.
  cerebral, **89.**
  optic nerve, **1.**
  orbital, (67).
  retinal, 638.
Syringomyelia, 912.

Tabes, 396, (534), 555, 714.
Tapayaxin, retina of, 317.
Tears, absence of, 317.
Telescope, 911.
Tendon resection, 475.
Tenon's capsule, **497.**
Tenonitis, **358,** 638, 639, 715.
Tenotomy, 556, 713.
Tension, 78, 157, 238, 476, 557, 638, **669,** 851, 914.
  and keratitis, 637.
  arterial 314, (841).
  decreasing in tumor of choroid, **872.**
  normal with loss of vision, (442).
  See glaucoma and tonomentry.
Test chart, 637, 911.
  colored, 314.
  moving, 157.
  uniform system of, 702.
  object, **5,** 314, 911.
Tetany, 240, 851.
Tetrahydroatophan, 392.
Therapeutics, (58), 77, 157, 237, 314, 392, 474, 555, 637, 713, (765), 782, 849, 911.
Thermophore, 911.
Thermotherapy, 238, 314, 783, 911.
Thrombosis, orbital, 478.
  retina, (451), 558, **855.**
Tic, spasmodic, 559.
Tonometer, **48,** 476, **669.**
Tonometric chart, 557.
Tonometry, 474, 476, 557.
  and prevention of glaucoma, **669,** (896).
  manual, 237.
Tonsils, 79.
  and retinal hemorrhage, (226).
Toti's operation, **477.**
Toxemias and iritis, (828).
Toxic amblyopias, 158, 239, 317, 394, 477, (534), 558, (623), 639, 715, 784, 851, 915.
  alcohol, 158, 558.
  arsenic, 639, 915.
  barium sulphat, 851.
  caffein, 158.
  carbon bisulphid, 784.
  ethylhydrocuprein, 158, 317.
  eucopin, 915.
  methyl alcohol, see wood alcohol.
  optochin, 158, 317.
  quinin, 158, 317, 477, 558, 639, (841), 915.
  tobacco, 394, 558, 852.
  wood alcohol, 79, 150, **284,** 394, (534), 558, (623), 639, 715, (763), 915.
Trachoma, 78, 157, (217), 238, 315, 393, 442, **475,** 556, (623), 636, 637, 714, 716, 783, 850, 913.
  among Chinese, 475.
  and flies, 393.
  chronic, (225).
  diagnosis of, 850.
  in army, 78, 157, 560, (622).
  in Kentucky, **422.**
  in Louisiana, 640.
  school, 240.
Transactions, see ophthalmological.
Transillumination, (621), 640.
Transplantation, (441), 913.
Trephining, **87,** (146), 316, (364), 393, (443). 638.
Trial frame, **491.**
  lenses, **686.**
Trichiasis, 318, 394.
  operation for, 433.
Trichloracetic acid, 239.
Tropical eye diseases, 157.
Tubercle of choroid, 393.
  of conjunctiva, (840).
  of optic nerve, 784.
Tuberculin, 78, 79, 319, 716, 849.

Tuberculoma cerebral, **80.**
scleral, 315.
Tuberculosis, (216), 237, **263,** 315, 395, 396, 479, 640, **661,** 714, 716, (832), 911, 917, 918.
of choroid, 557.
of conjunctiva, **206,** 556, 714, (840), 913.
of cornea, **133,** 238, 850.
of iris, **133,** 157, 850, 914.
of lacrimal glands, 916.
of optic nerve, 915.
of orbit, 478.
of retina, 78, (537), 638, (829).
uveal, 133, 157, 557, 664, 850, 914.
Tumors, 79, 159, 239, 318, 395, (438), 478, (545), 559, 640, 716, 852, 917.
cerebral, 394, 477, **736,** 852.
capsule of Tenon, **210.**
choroidal, 79, 144, 240, 318, 395, (621), 640, 716, 785, **872,** 852.
ciliary region 318, 395.
conjunctival, **113,** 240, 395, 478, 559, 683, 852, 917.
corneal, 240, 640, 716.
eyeball, 80, 159, 478, 559.
intradural, 852, 917.
intraocular, 478, 852.
iris, (66), 229, 852.
lacrimal, 318, (366), 559, 716.
lids, 80, 159, (218), 240, 318, 395, 478, 559, **602,** (687), 852, 917.
optic nerve, 159, 240, **665,** 852.
pituitary, 158, 239, 558, 571, 784, 852.
pseudo of uveal tract, **397.**
retinal, 318, 395, 716, 852.
Typhoid inoculation, 80, 479.
Typhus and syphilis, 159, 918.
exanthematous, 640.

Ulcer of cornea, 238, 315, (540), 556, 783, 850.
of lid margin, (377).
Ultrared rays, (58), **688.**
violet rays and cataract, **178,** 238, 395.
Uncinariasis, 915.
Unciform fossa and lacrimal drainage, (219).
United Kingdom Ophthalmological Society, (305), 606.
Uveal tract, 78, 157, 238, 315, 393, 475, 556, 557, 638, 714, 783, 850, 914.
pseudotumor of, **397.**
tuberculosis of, 557, 664.
Uveitis, 157, 315, 557, 638, 783, (828), 850.
atrophic, (625), 914.
Uveoparotidea, 78.

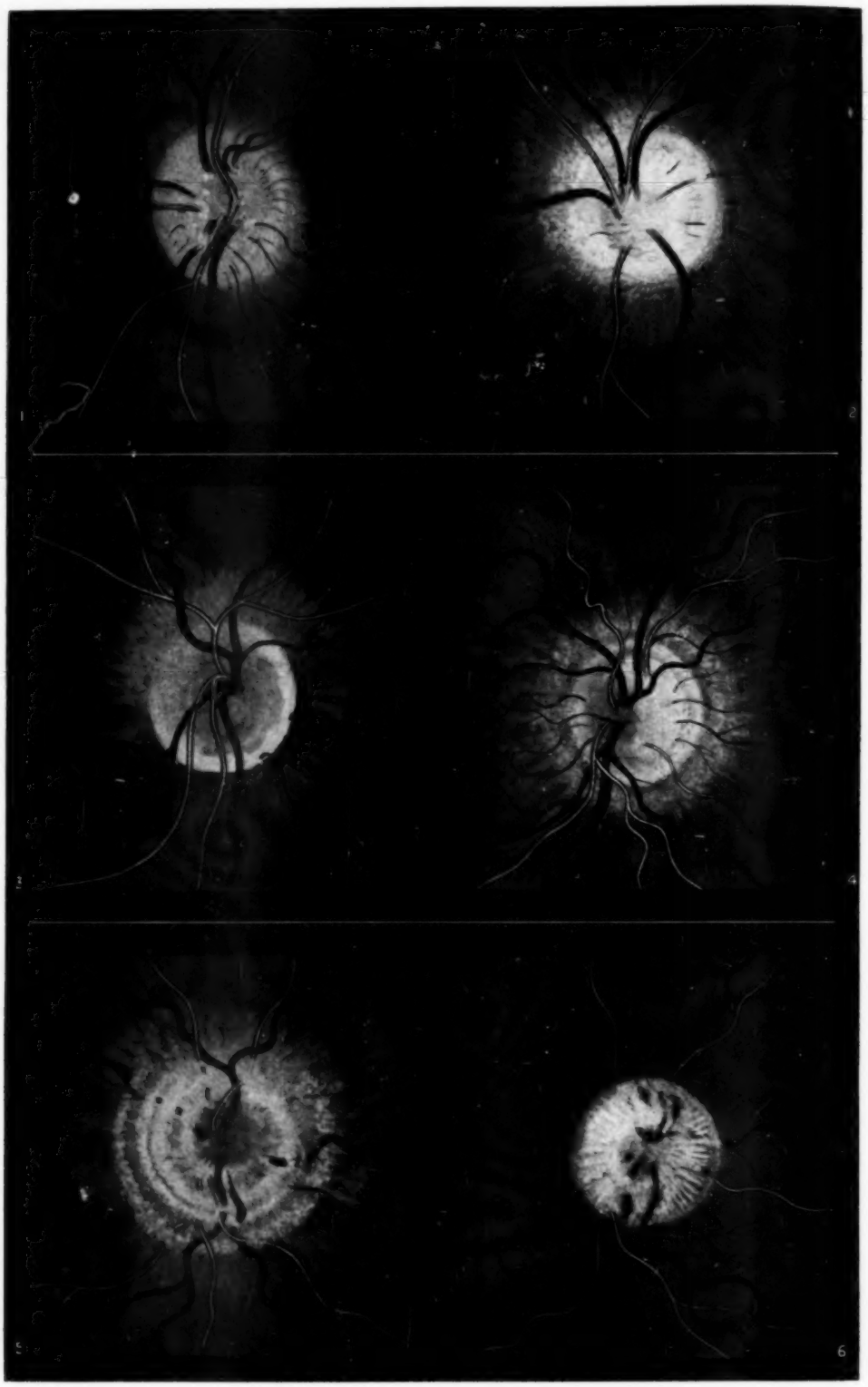
Vaccination, 475.
antityphoid, 78, (829)
of lids, **103,** 916.
Vaccine therapy, 237, 314, 783, 911.
Vademecum, 388.
Varicocele, 159, 318.
Venesection in hemorrhage, **23.**
Vernal conjunctivitis, **126, 130,** 238, 475, (523), (541), 556, 637.
Vertebrate eye, 853.
Vertigo, 782, 912.
Vestibular reflexes, 782.
Visibility of bright lines, 78.
Vision binocular, 555.
center of in brain, 79.
evolution of, 477.
foveal, 784.
in Academic Fellows, 157.
loss of, with normal tension, (442).
peripheral, 158.
phenomena of, 158.
theory of, 715, 784, 911.
twilight, **162.**
Visual acuity, 319, **335,** 392, (843), (885).
at low illumination, **408,** (770).
tests, **5,** 157, 314, 637, 702, (843), (855).
Visual fields, **49, 51,** 79, (620), 639, 784, 911.
fatigue of, 157.
in brain tumor, **736.**
in injuries, 558.
in maniacs, 849.
relief, 471, 715, 916.
tubular, 158.
Visual tracts and centers, 79, 158, 239, 317, 394, 477, 558, (630), 639, 715, 784, 852, 916.
Vitreous, 78, 238, 316, 393, 557, 638, 715, 784, 851, 914, 915.
cysticercus in, **290.**
hemorrhage, (224), 238, 638, 715, (829).
infection of, 316.
lactic acid in, 78.
hernia of, 914, 915.
opacity of, 638, 915.
origin of, **589.**
prevention of loss of, 316.
Vossius' ring, 316, 914.

War blind, 479, 480, **511,** (522).
injuries, 80, 159, (290), 319, 477, 478, 479, 560, (625), 640, **648,** 715, 783, 785, (906).
ophthalmology, 239, (285), 396.
Wasp-sting keratitis, **493.**
Wassermann reaction, 315.
Weber's syndrome, 77.
Welfare of blind, 80, 396, 479, 480, 560, 640, **785.**
Westphal's symptom, 475.
West Point cadets and visual defects, **39.**
Whale, retina of, 316.
Wood, Casey A., testimonial to, 155.
Word blindness, 477, 558, 784.

Xanthelasma, (827).
Xanthomatosis, 852.
Xeroderma pigmentosa, 159, 318, 559.
Xerophthalmia, 77, 393, 475, 556, 783, 913.
Xerosis epithelialis, (826), 836.
X-ray, 159, (226), 395, 558.
in corneal ulcers, 850.
in treatment of conjunctivitis, 556.

Yellow ointment, 637.
spot, 78.
Young, Thomas, 396.

Zona, 392, 637, 850.
Zoster, 78, 158, 475, (540), (619), (687), **756.**



NEURO-RETINITIS SYPHILITICA ET PAPILLEDEMA (WÜRDEMANN)

1. EARLY STAGE. 2. MEDIUM, WITH EDEMA. 3. MEDIUM. 4. ADVANCED.
5. INTENSE. 6. CHOKED DISK.

AMERICAN JOURNAL OF OPHTHALMOLOGY

Vol. 3 JANUARY, 1920 No. 1

SYPHILITIC NEURO-RETINITIS.

MAJ. HARRY VANDERBILT WÜRDEMANN, M. R. C., U. S. A.

SEATTLE, WASHINGTON.

This essay is the result of the surveys of a number of soldiers undergoing specific treatment in the U. S. Army Base Hospital, Camp Lewis, Washington, 1918-1919, together with conclusions drawn from private practice and the literature. A sharp distinction is drawn between true choked disc and inflammation of the optic nerve. The former is an edema, the retina being affected secondarily and true inflammation not necessarily taking place; the latter is an inflammatory process in which the contiguous retina is always affected. The paper deals mainly with the ophthalmoscopic findings, time of origin, duration and termination, with suggestions as to treatment. Experience has shown that therapeutic arsenic medication has had no effect upon the production of this lesion. Authority to publish granted, Board of Publication, S. G. O.

Neuro-retinitis syphilitica is a specific inflammation of the optic nerve and the contiguous retina. There can be no neuritis without an implication of the retina, but this in the light cases is confined to the retinal structures in the immediate neighborhood of the disc, and in others is accompanied by a diffuse retinitis. The inflammation extends into the optic nerve behind the globe to a varying degree in each case. Syphilitic retinitis is always accompanied by more or less papillitis; one or the other may be predominant and thus the lesion in each case may be denominated neuritis or papillitis, retinitis, or neuro-retinitis.

Choked disc is a papilledema which is restricted to the optic nerve, but not alone to the part observable by the ophthalmoscope—the disc,—but the edema exists behind the eye as well. It is not in itself an inflammation, altho in the later stages the infiltration may become so extensive as to cause inflammatory changes; and with this comes extension of the process to the retina, largely from infiltration through the adventitia of the vessel walls. Hence in severe cases of choked disc of long duration, a true papillitis or a true neuro-retinitis may be superimposed.

The specific cause of neuro-retinitis syphilitica is the local action of the toxins of the spirochetæ in the optic nerve, causing a true inflammation, with its syndrome of *rubor et tumor* (*sine dolor*); the latter sign being substituted in the case of the eye by *amblyopia,* for the visual nerve contains no sensitive fibers except those of sight;—hence the ophthalmoscopic findings and the loss of vision. Contrariwise in choked disc, at first there is swelling but no inflammation; and hence the two signs of redness and loss of sensation do not occur, unless secondarily followed by inflammation or unless exudation be so great that the nerve fibers themselves become infiltrated,—which is seldom the case,—and hence good vision is frequently present in the early stages.[1]

In inflammation of the optic nerve and retina, there are vascular changes at first, followed by exudation and edema, then infiltration and hemorrhage; later there is proliferation of the mesoblastic tissues of the vessel walls and of the neuroglia; of these the first group are most marked in acute inflammation, the second in the more chronic, but both are invariably present.[2]

Choked disc is in the end only the ophthalmoscopic expression of a general edema of the nerve.[3] The cause is an edema of the dural sheath, leading to a lymph stasis at the optic foramen and a blocking of the lymph streams from the retina, disc and nerve; and this arises from intra-cranial pressure due to trauma, or inflammatory changes in the membranes

of the brain or spinal cord; to actual increase in the cerebral contents by reason of neoplasms in the brain or cord, or to diminution of its caliber by contraction of its walls, as from depressed fractures of the skull or spinal column, or new growths extending inwards from the cranial surface or spinal canal.

Ophthalmoscopic signs of neuro-retinitis vary with its gravity. At first there may be and usually is, no visual complaint from the patient, and the lesion may be only incidentally discovered. Such was so in nearly all of the cases found in the soldiers examined during the surveys of syphilitic patients at Camp Lewis. In four hundred and sixty syphilitics, there were found fourteen cases of optic neuritis, in only four of which had the patient observed any diminution of vision or eye signs; in ten of these I made paintings of the fundus; in the optic nerve cases only the nerve and contiguous area being represented. The editor of this journal has selected five from this series for illustration of this article together with one of true choked disc.

The mildest grade is shown in Fig. 1, case 39: C. E. P., Pvt., Inf. Co. 3, 166 D. B.—Aged 30, Dec. 27, 1918. No complaint of eyes.—Under treatment for syphilis, Ward 13. V. R. 20/20, L. 20/20. Beginning of the lowest grade of optic neuritis. The upper nasal edges of the disc blurred, slight enlargement and tortuosity of veins.—The choroidal ring is pronounced at macular side. L. E.

Slightly further advanced is that of Fig. 2, case 37: L. R., Pvt., 31 Co. 166 D. B. Age 26, Dec. 14, 1918. No complaint of eyes. Undergoing specific treatment in Ward 13. V. R. 20/20, L. 20/50. Low grade of optic neuritis most pronounced in left eye.—The major vessels normal but increase of minor on disc, which is slightly swollen and macular edge decidedly blurred. L. E.

A medium stage is that of Fig. 3, case 40: B. P., Pvt. 355, Motor Trans. Corps. Age 22, Dec. 27, 1918. No complaint of eyes. Under treatment for syphilis, Ward 13. A medium degree of swelling of disc with distention, great tortuosity and increase of blood vessels. The inferior nasal vein is enlarged and slightly sausage form. L. E.

Another medium stage is that of Fig. 4, case 38: J. B., nurse U. S. A. Age 35, Dec. 24, 1918. Mucous patches tonsils and fauces Oct. 24, 1918. Wassermann ++ Undergoing specific treatment Ward 13. Ten salvarsan, Hg. and K. I. None lately. Blurring of vision Dec 23. V. R. 20/30, L. 20/30. Mild grade neuro-retinitis both eyes. The swelling most pronounced on nasal side. Disc rather pale—no increase of blood vessels. L. E.

An intense degree is shown in Fig. 5, case 41: A. T., Corp. Co. B. 13, Amm. Train. Age 25, Nov. 19, 1918. Noticed two weeks, severe headaches—had chancre in Mar. 1918 before enlistment followed by light secondaries. V. R. 20/70, L. 20/40. Wassermann + +. Referred to Ward 13 for specific treatment. A typical picture of inflammatory swelling of the disc of 5 D, with exudate about vessels and in retina. R. E.

Opportunity was afforded in all these cases for further examinations during the course of the specific treatment. One, two and three made full recovery with return to normal of the ophthalmoscopic appearances; and in none of these cases did I discover any evidence of Thomas' signs. In the fourth case at the last examination, five months after the drawing was made, the discs appeared pale and the blood vessels somewhat contracted, and the characteristic blurred depression of the optic disc was observed. The fifth case passed from observation and hence the result in vision and ophthalmoscopic appearance cannot be stated.

It is perhaps well, here to call attention to the great contrast in the ophthalmoscopic findings of neuro-retinitis and of true choked disc, which is particularly evidenced in Plate 6, case 42: J. E. G., Cpl. Co. 45, 166 D. B. Age 31, 10, 1918. Fracture of skull about fourteen hours before. Unconscious, in Ward 51. Decompression operation by Major Rockey, 11:00 A. M. Death 7:59 P. M. Pupils slightly dilated, especially left, absence of reflex to light, slight divergence, cadaveric position of eyeballs, edema both

discs, veins dilated and tortuous. A typical example of intracranial pressure. R. E.

Here it will be noted that the optic nerve stands out like a button from the depth of the eye. The swelling here was extremely great, fully 6 D., whereas in the low cases of neuritis there is little or no difference in the refraction of the disc and retina. In the mild grades of neuritis it is true that the normal physiologic cup may be filled in by the edema; but the nerve area is yet a little depressed or at least level with the rest of the fundus. Even in a high grade of neuro-retinitis it will be found that the swelling of the nerve scarcely ever exceeds two or three D. Such findings are likewise to be found in optic neuritis from other sources; this occurring in renal disease, diabetes and blood vessel degenerations.

The writer has made several hundred paintings of the fundus, and thus has had occasion to observe minute changes in findings that would not be noticed in ordinary practice; these observations extending over thirty-two years and embracing a very large number of cases. It is his opinion that the cause of an optic neuritis is always due to the setting free of some toxin in the optic nerve itself, attended by infiltration and inflammatory changes in the blood vessel walls extending to the neuroglia, followed by the functional and objective signs. Whereas the cause of edema of the optic nerve, or choked disc, is always mechanical and due to increase of intracranial pressure with a possible exception of pressure on the optic nerve itself within the orbit from trauma or neoplasm, the latter of which he has never observed.

The course of low grades of optic neuritis, from whatever cause, varies from a few weeks to several months and may be followed by complete resolution. In severe types, especially if the systemic origin still obtains, however, these cases go on further and ultimate in more or less grayish atrophy of the optic nerve, in which owing to the deposit of connective tissue at the edges of the nerve, its periphery always remains somewhat ill defined; in contradistinction to true atrophy, as in tabes or other spinal cord affections, where the edges of the nerve become clear cut, and always in the latter with more or less extinction of sight.

The treatment of optic neuritis is that of its cause. It is generally medication, to eliminate the poison from the system before its local action has caused sufficient inflammatory changes to result in a deposition in, or infiltration of or about the nerve fibers. Thus urgent treatment is indicated;—massive doses of the specific medication. In some cases where the edema of the optic nerve and swelling are great, besides the specific treatment, free diaphoresis by pilocarpin and hot packs, and free purging by alkalines rapidly reduce the local danger of squeezing the nerve fibers from the swelling of their sheaths.

There is no beneficial local treatment. Patients should certainly not subject their eyes to strain, and must protect them from irritating sources of light and heat, by dark glasses or those which cut out the actinic rays of light in large part, as the Noviol or Crookes lenses.

Thus it is in all inflammatory diseases of the eye which are due to syphilis, or in which the latter is a factor, energetic treatment must be given, and to date for this purpose, arsenic and mercury are the most powerful remedies that we possess.

It is believed by the writer that the reports of blindness, and especially of cases of optic neuritis from the use of therapeutic doses of arsenic, made some years ago, were improperly promulgated and imperfectly substantiated. Certainly six months observation of the very considerable material met with in the Base Hospital, and from years of private practice, have shown that in therapeutic doses arsenic in the human being has produced no untoward effect upon the eye. Further, clinical evidence supports the view, that where cases of inflammation of the retina and the optic nerve arise in

syhphilis, their course has been hindered by the administration of arsenic; in fact, in all such cases the lesions have melted away leaving little or no trace of inflammatory products or degenerations. No cases of optic nerve atrophy have been observed even where such patients have given histories of many salvarsan injections; one of them having received twenty-seven such, in addition to large doses of mercury and the iodides during several years. It is believed by the writer, and is substantiated by others, that the ocular lesions occuring in syphilis are due to the irritating effects of the toxins of the disease. It may be that in the course of strenuous treatment that the spirochetae may be more or less suddenly released from their local environment, and thereby set up a certain amount of active irritation, which may be seen in the eye as an inflammation of the optic nerve.

In support of this contention the writer together with Captain John A. Johnson[4] M. R. C., U. S. A., made certain investigations upon rabbits by administration of therapeutic and likewise excessive doses of arsenic, using the staple therapeutic syphilitic medication (arsphenamin) for the purpose. Some of these rabbits died, others were under observation after four months. In none of these has any ocular lesion been produced thereby. Certainly this experimental study, as far as it goes, shows that arsenic has no effect upon the optic nerve. And this is in direct opposition to the previously conceived notions on the subject and especially against the observation of de Haas,[5] who in eight thousand cases of optic nerve diseases found ten of optic neuritis or optic nerve atrophy ascribed to arsenic, and quotes five others. None of these, however, were due to arsenic used for the treatment of syphilis, but were from wall paper, paint, and tooth filling origins.

From these surveys and in previous clinical experience, the writer has found in a large number of cases ophthalmoscopic evidences of syphilis, without other signs; and of the existence of which the patient was unaware, and this in recent years has been substantiated in every case by complement fixation tests. Thus the ophthalmologist may become of great importance as a diagnostician.

From these surveys and previous several ophthalmoscopic examinations and every case in which luetic lesions are found by incidental examinations of the oculist, should receive complete specific treatment.

REFERENCES.

1. Parsons. The pathology of the Eye, l. v. 2, p. 675.
2. Ibid., p. 568.
3. Paton, quoting others. Ophthalmic Review, March, 1913.
4. J. A. Johnson. Amer. Jour. Ophth., v. 2, p. 741.
5. de Haas. Geneeskunde Bladen, v. 20, No. 2.

TEST OBJECTS FOR THE ILLITERATE.

A. E. Ewing, M. D., F. A. C. S.

ST. LOUIS, MO.

This is an historical description of such test objects suggested by different writers from 300 B. C. to 1918 A. D., with illustrations of them and discussion of the principles that should control the selection of objects for such tests. Read before the St. Louis Ophthalmological Society, April 22, 1918.

The importance of this subject is brought home to the ophthalmologist in the realization that the illiterate test object, or an object that may be recognized and interpreted by any person, child or adult, ignorant or educated, anywhere in the world, is the basis for all other test objects. An example is the two stars by which Hooke determined the standard visual angle as the angle which subtends an arc of one minute. Ophthalmology is deeply indebted to Ed. Pergens, Maeseyck, Belgium, for his researches in visual acuity, in which the above subject is included and from which an important part of the following article is taken.

Discussions with regard to the acuity of vision evidently existed in the time of Euclid, 300 B. C., at least in the minds of scientific men, as is shown by the following proposition quoted from his work on optics.[1] (Fig. 1.)

Translation: Rectangular magnitudes when seen from a distance become peripheries (or curves).

Let the right angled figure BΓ be elevated and seen from a distance. Then, since each visible thing has a certain measure of distance at which it can no longer be seen, the angle Γ does not appear, and only the points Δ Z are seen. This will happen equally in the case of the three remaining angles. Thus the whole will appear to be a periphery (or curve).

The clearness of this reasoning has never been gainsaid. Altho the art of writing had been in existence for thousands of years, this is the first definite measure of visual acuity that is recorded, and the principle involved is still the most valuable in the selection of objects for the practical determination of visual acuity. Even this deduction of Euclid appears to have found no practical application during his time or for centuries later, as the next mention of an investigation into visual acuity is that Ibn el Haitham in the 11th century employed a written text for certain researches in physiologic optics[2]

For determining the degree of myopia in the illiterate Daça de Valdes,[3] an optician, in 1623 made use of mustard seed. These were placed in line and the patient was per-

ϑ'.

Τὰ ὀρθογώνια μεγέθη ἐξ ἀποστήματος ὁρώμενα περιφερῆ φαίνεται.

ἔστω γὰρ ὀρθογώνιον τὸ ΒΓ ἐστὼς μετέωρον ἐξ ἀποστήματος ὁρώμενον. οὐκοῦν, ἐπεὶ ἕκαστον τῶν ὁρωμένων ἔχει τι μῆκος ἀποστήματος, οὗ γενόμενον οὐκέτι ὁρᾶται, ἡ μὲν Γ ἄρα γωνία οὐχ ὁρᾶται, τὰ δὲ Δ, Ζ σημεῖα μόνον φαίνεται. ὁμοίως καὶ ἐφ' ἑκάστης τῶν λοιπῶν γωνιῶν τοῦτο συμβήσεται. ὥστε ὅλον περιφερὲς φανήσεται.

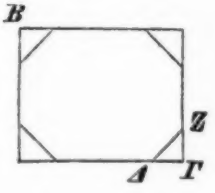


Fig. 1. The first recorded visual test, devised by Euclid 300 B. C.

mitted to approach until they were recognized. This was the visual far point of the patient from which the strength of the glass to be worn could be computed. For taking the measurements Daça employed a rod, on which the curvatures of the glasses for various distances were computed. With persons who could read he had recourse to the prayer-book. Other opticians of his era, and those preceding him from the time of the invention of spectacles early in the 14th century, probably employed such test objects as each individually preferred.

Previous to the invention of spectacles, the fitting of which required some well - defined test object, the method mentioned as being ordinarily employed for determining the vision was to approach the eyes with the hand, or with the hand having the fingers spread apart, and if the patient did not blink he was considered to be blind. However, in contradistinction to this, "sharp as a needle" and "fine as a hair" seem to have been common expressions. In the New Testament the mustard seed is mentioned as the "least of all seeds." As seeds were employed by Daça de Valdes and later by Lawson[4] for testing vision it is possible that they may have found some such use among the ancients. The earliest record is found in the New Testament (Matthew 13, 31; 17, 19, Mark 4, 31; Luke 17, 6.). At the present time seeds are used for testing the vision of people in India, as is shown in the following passage from an article entitled "Another New Operation for Cataract" by Tasadduk Husian[5], "963, including 146 bad cases, recovered, i. e., had sufficient vision to read or to recognize *cereal grains* with glasses."

With regard to the theory of the sense of vision, the anatomy and the physiology of the eye, and the manner in which vision is produced, a great deal was written, ancient and medieval, but it was Robert Hooke who established the angle of vision as the angle subtending an arc of one minute. This he deduced by observations on closely approximated stars. In a discussion with regard to the construction of astronomic instruments before the Royal Society of London, January 15, 1674[6], he demonstrated by means of a rule with proper divisions for definite distances that it was impossible to distinguish divisions of less than one minute with accuracy. Later in the same year he showed that the eye could not distinguish heavenly bodies separated by an angle of less than thirty seconds and only with difficulty could one person in a hundred distinguish such bodies separated by an angle of one minute. Following this the discussions of vision and visual acuity by scientific men were numerous, but no practical attention was given the subject in connection with the examination of the eyes.

The first types that were arranged for the purpose of testing the vision were printed in 1816 under the direction of Tauber[7], a Leipsic physician, who conducted an optical institute. Characters were first employed by Küchler in 1835 or 1836, who cut from almanacs small black pictures of men and women, cannon, guns, birds, farm implements and animals, and pasted them on paper in the order of their size, and used them as test objects in the measurement of vision. Because of the inequality in the legibility of the pictures due to the variety of their outlines, he recognized that the choice among them as test objects was limited.

Küchler was also the first to suggest a standard for testing the vision of patients, which could be employed by anyone anywhere. As he expressed it:

"(1) A measure of vision for those with weak eyes, and a measure that would be common to all practitioners.

"(2) A measure of vision by which the same patients could be tested at varying intervals of time, and a measure of vision that would be recognized by all physicians as being exact."

With regard to the employment of such tests his rules were:

"(1) To have several letters or words for the same distance which could be interchanged.

"(2) The tests should be printed in type of the same size on the same unglazed white paper.

"(3) Best that only one number at a time be exposed.

"(4) The weaker eye should be measured first and always by good daylight.

"(5) The light should come from the side in order that there should be no dazzling and no loss of light.

"(6) Atmospheric conditions that change the intensity of the light should be taken into account in making the measurements."

To Küchler belongs the further credit of having first arranged test letters in series, but only for testing the near vision. The ratio was irregular and ranged from 1 to 12 with the heights of the letters varying from 1.5 mm. to 21.5 mm.

In 1854 Eduard Jaeger[8] published the first test-type to be employed for measuring the distant and the near vision. He included with this set of test-type a series of lines arranged in logarithmic progression (= logarithmic scale or geometric progression) varying in length and width, with a white line next a black line, equal in width to the black line which it followed. This test had the appearance of a paling fence seen in perspective, with every tenth post twice the height and every fifth post one and one-half times the height of the palings, as shown in Fig. 2.

Its visual range was from one to twenty Vienna feet, the line No. 30 being for 20 feet. The width of the first line was 0.0037 of a Vienna foot (the Vienna foot is 12.4 English inches). The point in the examination was to distinguish the white spaces in the fence as far along as possible. It was excellent vision to separate the lines at 80 (not shown in the accompanying diagram), altho eyes endowed with better vision could separate them three to five lines beyond this number. This

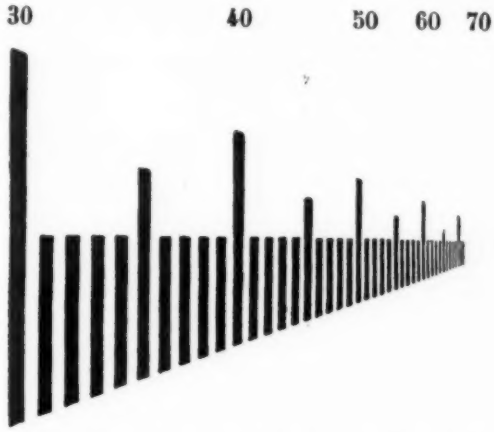


Fig. 2. The second recorded visual test for illiterates. Devised by Eduard Jaeger, 1854.

was an important step forward in the construction of test characters, in that it was the introduction of white and black lines of equal width and in geometric progression. As this test could be employed with anyone, it may be counted as the second standard illiterate test, that of Euclid being the first.

The next tests for illiterates were those arranged by Streidinger, at the suggestion of Deputy Inspector-General T. Longmore, in 1860, for testing the eyes of recruits for marksmanship in the English army, each eye being examined separately. They were designated by Longmore "miniature bull's-eyes." They consisted of round black dots irregularly arranged in

groups of from 2 to 9, with a space between the dots about equal to the diameter of the dot. Their size was based on the principle of a bull's-eye, 3 feet in diameter to be seen at a distance of 900 yards. The accompanying illustration, Figure 3, shows one of the plates.

The dots were printed on cardboard, which was mounted in a frame that was arranged to carry another movable cardboard in front of the dots so that only certain groups could be exposed at one time. The requirement of the service was that the dots in each group should be counted by each eye separately.

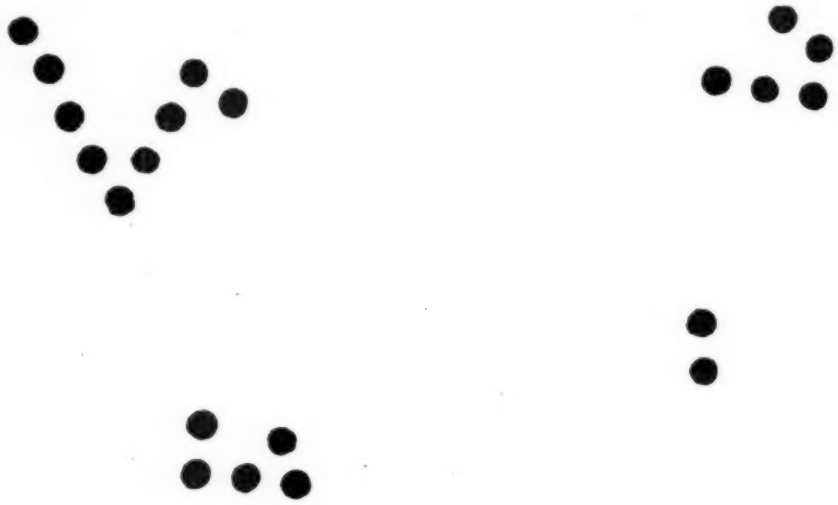


Fig. 3. The third recorded visual test for illiterates. Devised by Streidinger and Longmore in 1860.

This test was later modified by Snellen to correspond to the 1 and 5 minute scales of Donders. Longmore[9] says, with reference to this modification by Snellen:

"In the volume of the Army Medical Reports of 1860, I published some observations on the examination of the visual fitness of recruits for military service, with special reference to instruction in the use of the rifle. In these notes sets of types, numbered in accordance with those assorted for universal reference by Professor Jaeger of Vienna, and sets of dots corresponding in sizes with Jaeger's test-types for those who could not read, were recommended for testing the power of vision. Since that paper was written, Professor Snellen of Utrecht has published a regular series of types of fixed dimensions, possessing certain definite relations one type with another. They present several advantages over Jaeger's types for military use, particularly for meeting cases where it is supposed that deception is attempted; on the one hand, to make it appear that the sight is strong enough for a soldier, on the other to prove the existence of a defect for the purpose of escaping military service. On this account I have recommended their issue for the use of army surgeons, and the Right Hon. the Secretary of State for War has been pleased to sanction the expense incurred by their distribution. Dr. Snellen's preface to his collection of optometric test types explains the principles on which they have been designed and the manner in which they are employed. I need not, therefore, refer at greater length to the subject here."

In 1862 Snellen published his system of tests arranged on the plan of a one minute line and a one minute space in

a square of five minutes, previously suggested by Donders in the same year. Also for expressing the visual acuity he adopted the formula of Donders $V = \frac{d}{D}$. His test types were an improvement on anything previously published, in that the lines or the strokes of the letters or characters were of an even width. This edition contained the checkerboard and the three lines placed both vertically and horizontally, but they were intended for the detection of astigmatism. In the edition of 1866 he purposely included for illiterates a wall chart which contained the checkerboard, the ring, the square, the three lines placed both vertically and horizontally, the L, the interrupted five minute square, the T and the Greek or St. George's cross, the L and the interrupted square being employed in different positions.

In the edition of 1868 he introduced another card for illiterates which was headed with the square and followed by the interrupted square and by two parallel lines three minutes apart, each placed in the different positions, up, down, right, and left. In the edition of 1873 he made a further change by the final adoption of the E placed in the different positions, up, down, right, and left. The several designs of Snellen with the exception of the three minute two line figure are shown in Fig. 4.

While we may rightly consider the rectangular parallelogram of Euclid, the paling fence of Jaeger and the "Miniature Bull's-eyes" of Longmore and Streidinger as illiterate tests, to Snellen belongs the credit of having introduced individual characters arranged on a definite scale, by means of which the vision of illiterates could be measured and compared by oculists in any part of the world.

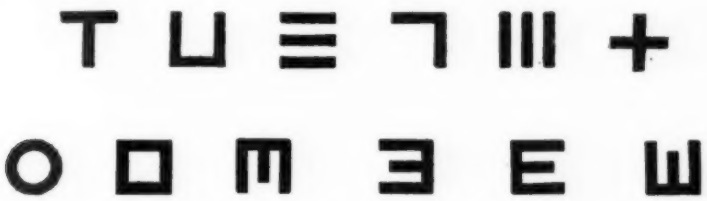


Fig. 4. The fourth recorded visual test for illiterates. Devised by Hermann Snellen, 1862-73.

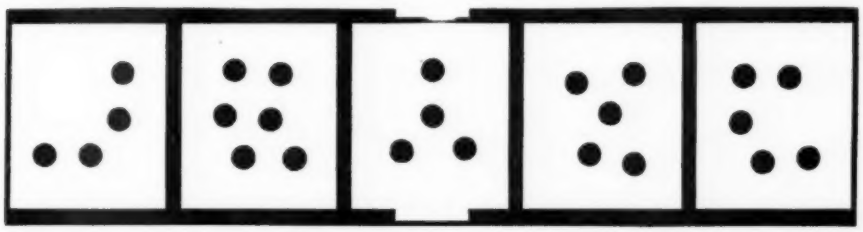


Fig. 5. Example from illiterate tests by Burchardt, 1870.

During the year 1870 Burchardt published his "Internationale Sehproben zur Bestimmung der Sehschärfe und Sehweite." These consisted of the dots of Longmore and Streidinger arranged in squares, but irregularly, with the space equalling the diameter of the dot, the angle for the size of the dot being 2.15 minutes. The edition included both near and distant tests, with twelve intervals for those for the near, from 6 to 23 inches, and four intervals for those to be used for the distance, beginning with 3 and 2/11 feet and ending with 51 feet. A plate from these tests is shown in Fig. 5.

Also in 1870 Boettcher published his "Geometrische Sehproben zur Bestim-

mung der Sehschärfe bei Functionsprüfungen des Auges," in which he included four plates that consisted of groups of squares and rectangles, an example of which is shown in Fig. 6. They were arranged on the basis of a two minute angle for the squares. The rectangles are the width of the squares, but some are twice, some three times longer than this width. There is always a two minute space between the squares or

Fig. 6. From the visual tests of Boettcher, 1870.

rectangles in the group, and in places a four or a six minute space.

His reasons for introducing these tests were that many persons could not readily comprehend the Snellen Latin type, for instance children. Also, being in geometric forms they were more accurate than other tests. This made them of especial value for army examinations. In the examination it was required that the number of figures in each group be counted and the difference in their sizes indicated. The figures were unlearnable because they could be turned into several positions. They possessed a further value in that they could be employed in the correction of astigmatism, because the long axis of some of the figures was at right angles to that of others having the same range of visibility.

Several new characters were added to the illiterate test list by Galezowski in connection with a set of test types published by him in 1874. These characters were the heart, the club, the spade, and the diamond, all in solid form, and he included the ring and the square of Snellen. These were printed in white on a black ground. Nine years later, in his edition of 1883, he added to these characters the triangle, the T, the L, and the interrupted five minute square, and the diamond with a black center. In both editions he employed the one and five minute angles for the lines and for the sizes of the characters. These characters are illustrated in Fig. 7.

Marini[10], medical military physician for Bologne, published a set of characters for testing illiterates in which he added to the square, cross, L and ring of Snellen the horseshoe, the trident, the hook and the key. These are shown in Fig. 8.

They were arranged on the basis of the one and five minute angles and for the distances in feet 20, 30, 40, 50, 70, 100.

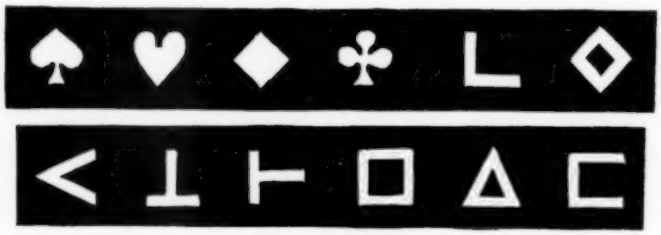


Fig. 7. The illiterate tests of Galezowski, 1874-1883.

Several new test objects for the illiterate were introduced by Albini[11] in 1878 in connection with plates of letters and figures. They are illustrated in the accompanying diagram, Fig. 9, which was enlarged from the work of Pergens.

They consisted of a table, a chair, a triangle, a ring, a candlestick with candle, a drum, a book, a violin, a flower with three leaves, a bottle, a bird, a shoe, a dark dice, with three spots, a spoon, a scissors, a carving-knife, a white dice with five spots, a fork, a pitcher, a ladder, a horn, a cup, a hand closed except for

the pointing forefinger, an apple, a hammer, a dagger, a hand glass, eyeglasses, a crown, and a heart, each figure being in a small square. There were seven sizes, ranging from one to eighteen mm. in height. Evidently they were unsatisfactory, as they were omitted from the second edition published in 1882. In the third edition, published in 1885, the E of Snellen was adopted.

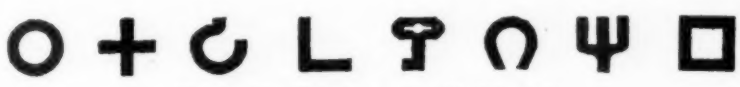


Fig. 8. The illiterate tests of Marini, 1875

In 1884 Professor Pflüger, Bern, Switzerland, published a set of type, "Optotypi," based on the one and five minute scale of Donders, in which he arranged letters with characters for the illiterate on the same line, the characters being some of those of Snellen, viz: the square, the cross, the two parallel one minute lines placed three minutes apart and the parallel lines. Also he employed the E with the center line shortened two minutes. To these he added a new design which is an inverted pyramid consisting of a five minute black line one minute in width, a one minute space, a three minute black line one minute wide, a one minute space and a black square one minute in size. This design is shown in Fig. 10, together with the three line test of Snellen and two letters.

This group also illustrates the manner in which the letters and the characters were arranged in other groups. Pflüger employed the Snellen formula $V = \frac{d}{D}$

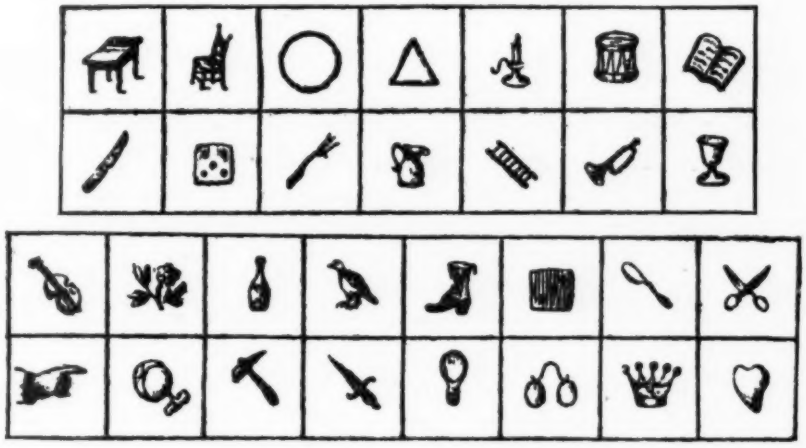


Fig. 9. The illiterate tests of Albini, 1878.

and dedicated his work to his friend Snellen.

Because of the difficulty in inducing children and stupid illiterates to name the position of the Snellen E, or to hold its duplicate in the hand in the same direction as the character on the chart, the author constructed a set of test-type for illiterates in 1886 which consisted of the square, the ring, the cross, the crescent,

the horseshoe, the pitcher, the star, the straight chair and the rocking chair. The interval chosen for these characters was the geometric ratio $\sqrt{\ } \frac{1}{2} = 0.7071$, first proposed by Dr. John Green at the American Ophthalmological Society, 1867; and the range of distance was from 3.5 meters to 56 meters. As characters dif-

Fig. 10. To the right is shown the new illiterate character by Pflüger in 1884.

fer from letters in that they may vary slightly in size without offending the eye, the five minute square constructed of one minute lines, arranged for forty meters, was assumed to be the normal and the other characters were drawn to have as nearly as possible similar legibility. These characters were printed in connection with a set of test type arranged by Dr. Green and the author, which consisted of block letters in which the finish of the letters was made of half squares instead of full squares, as in the case of the Snellen letters. This change was suggested by Dr. Green at the Fourth International Ophthalmological Congress in London, 1872, in order to secure better legibility and better proportions for the letters. The gradation for these letters was in the geometric ratio $\sqrt[3]{\ } \frac{1}{2} = 0.7937$ proposed to the American Ophthalmological Society in 1868. These letters and characters were constructed on the one and five minute scale. The characters are shown in Fig. 11.

Experience with these characters demonstrated that the crescent was worthless as a test object, that the outlines of the pitcher were such that it was often confused with the square, and that an improvement could be made in the legibility of the star. For these reasons a new edition was published by the author in 1902 from which the crescent was omitted and corrections were made in the pitcher and the star. Also three other characters were added, a heart, a teapot and a tin cup or mug, all in outline. These characters have been very satisfactory, altho the teapot has been found to be somewhat more difficult of recognition than the others and the chair is a little more easily recognized. The

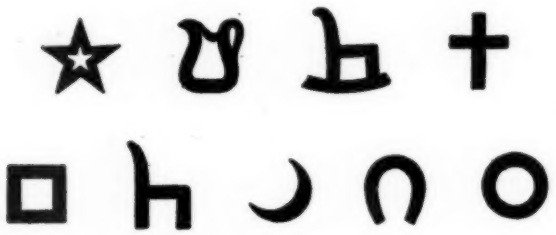


Fig. 11. The illiterate tests of Green and Ewing, 1886.

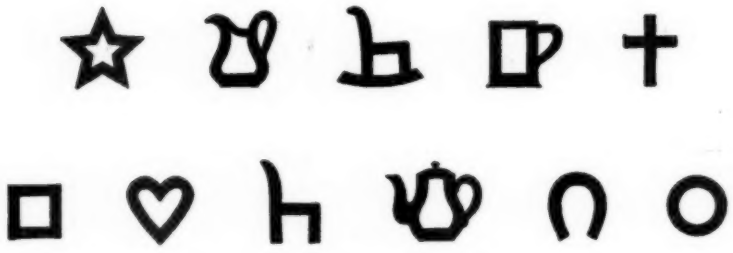


Fig. 12. The illiterate tests of Ewing, 1902.

legibility of all of these characters compares favorably with test letters of the same approximate size so that they may be readily interchanged. The characters of the edition of 1902 are shown in Fig. 12.

The broken ring test, Fig. 13, was introduced by Landolt, Paris, France, in 1888. The ring was selected because of its continuous outline and round form, no one part of it being more readily recognized than any other part. Twenty-one years later this test object was adopted by the International Ophthalmic Congress as the standard international test object, by which all other test objects should be graded.

Fig. 13. The illiterate test of Landolt, 1888.

In 1889 Dr. Arnold Lotz, Basil, Switzerland, published his "Internationale Sehprobentafel," Echelles Internationales, which differ from those of Snellen by the employment of a single line vertical and two lines horizontal or vertical and the St. Andrew's cross. They were arranged on the one and five minute scale for distances of from 6 to 60 meters. Fig. 14.

Fig. 14. The illiterate tests of Lotz, 1889.

A new test object on a one and three minute scale, the "Interrupted Square" (Fig. 15) was introduced at the American Medical Association by Dr. Edward Jackson in 1891, his purpose being to obtain a test object which would be legible and yet smaller than the standard five minute angle of Donders employed by Snellen.

As an addition to a set of test types, letters and figures published by him in 1892, Wolffberg included a card of illiterate tests arranged on the one minute scale for the thickness of the lines, but he ignored the five minute angle for the size of the objects. These pictures are shown in Fig. 16.

In 1910 he revised these picture tests and brought them nearer to the standard five minute angle in size. Also, instead of employing the usual continuous lines, he constructed the lines by adjoining dots to one another, in black or white, dependent upon the background. These later pictures are constructed on his idea of bases and indices, the bases being of two orders, the oval and the line. The index is a dot or a square which subtends the angle of one minute. This principle was illustrated by Descartes in 1637 as a visual unit. The oval, according to Wolffberg[12], is constructed of ten indices in continuity and the line of five indices in continuity. He takes a general form such as a rectangular parallelogram and by adding indices in dots he constructs a pennant. In a similar manner he constructs a wagon from the parallelogram when placed in the horizontal position, or by placing it in a vertical position he constructs a mug. The object is thus

defined by the number and position of the indices. These figures are illustrated in Fig. 18 on a white background and in Fig. 17 on a black background.

In the same article and the same year Wolffberg introduced his Cross-point test, which consists of four squares each three minutes in diameter, three of them black and the fourth black with a central white dot one minute in diameter constructed in the form of a cross about a central white square three minutes in diameter, Fig. 19. It is employed by designating the position of the square containing the white dot.

Wolffberg[13] designed another test in 1915 which he designates as his "Line-point" test. This test consisted of an

Fig. 15. The illiterate test of Jackson, 1891.

octagonal board on one side of which at the center was a line one minute in width and five minutes long. On the other side there was a line seven minutes long with a one minute break one minute from the

Fig. 16. The illiterate tests of Wolffberg, 1892.

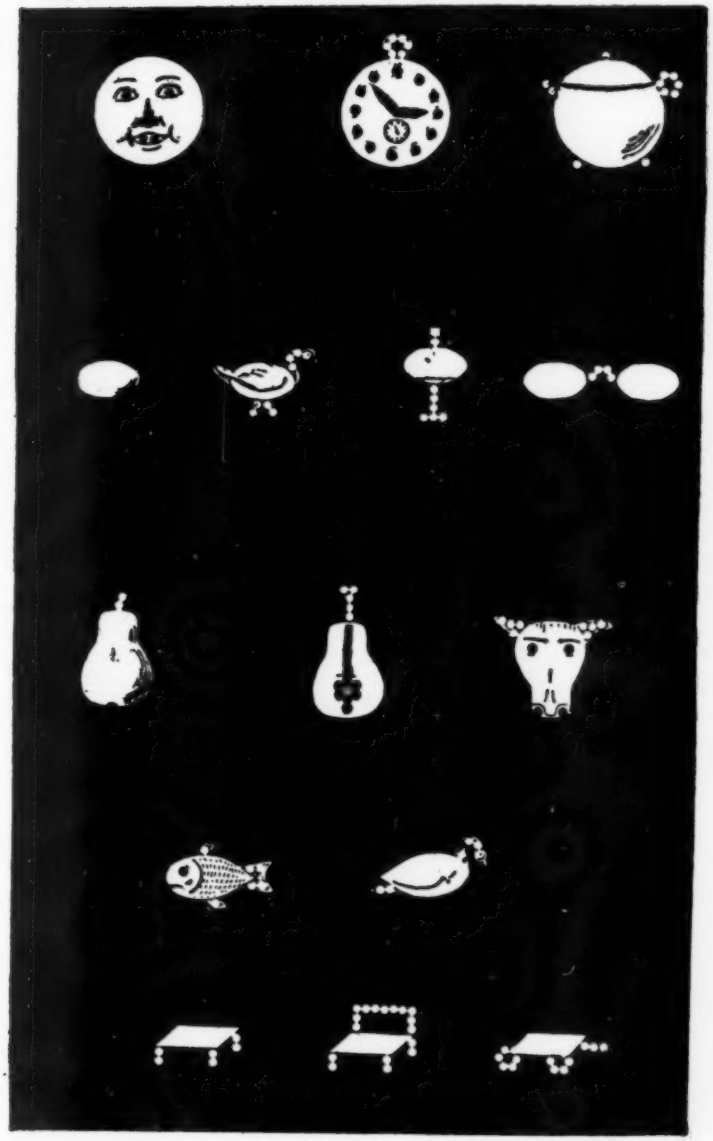


Fig. 17. The illiterate tests of Wolffberg, 1911, on a black background.

end, that is a line one minute wide and five minutes long, a one minute break and a one minute square. By reversing the octagonal board the patient was to determine the line which contained the break. The test was arranged on an octagonal board in order that it might be turned in any direction for the detection of astigmatism. It is illustrated in Fig. 20.

The "miniature bull's eye" of Longmore was employed by Guillery, Cologne, Germany, 1891, by placing a single dot somewhere in a rectangle or a square which was constructed with heavy lines. His object in introducing this test was to obtain the simplest form of test-type, which would also be mathematically correct. The visual test was to recognize the position of the dot within the square.

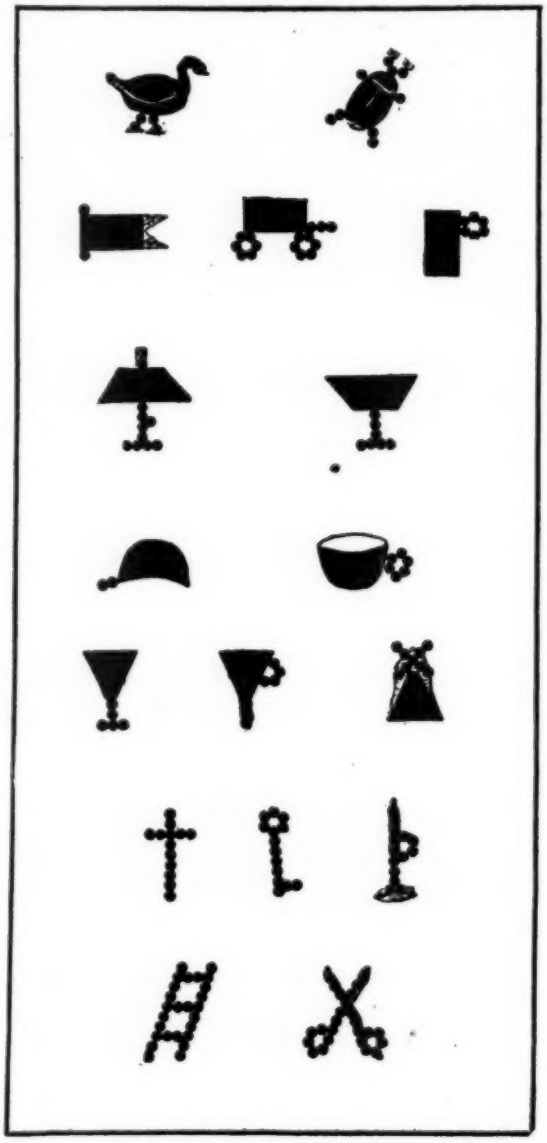


Fig. 18. The illiterate tests of Wolffberg, 1911, on a white background.

An example of this test object is given in Fig. 21.

In addition to this he employed, as tests for near vision, the figures shown in Fig. 22, and planned them to correspond to certain sizes of the Jaeger type.

Instead of the one minute visual angle he selected the angle of fifty seconds and arranged the test objects for distance for the several ranges 5, 7, and 10 meters on a visual percentage basis.

In 1893 Pergens utilized as an illiterate test object the three line five minute test

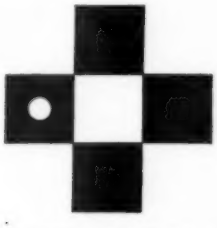


Fig. 19. The "Crosspoint" illiterate test of Wolffberg, 1911.

of Snellen by blocking the lines at one end with a fourth one minute line, thus forming an E (Fig. 23) with the three horizontal lines equal in length. It was utilized by the open end being turned in different directions the same as the Snellen E.

Taking the idea from the act of testing the vision by means of the fingers, spreading the index and middle fingers and closing the thumb and the third and fourth fingers, Albrand in 1894 published a set of illiterate tests on the Snellen scale which consisted of two one minute lines, five minutes in length joined in an acute angle, Fig. 24. It was employed by being turned in different directions.

This test was employed for the wall chart. For the near test he employed the one minute squares, which were first introduced by Snellen, and were later used by Boettcher in connection with rectan-

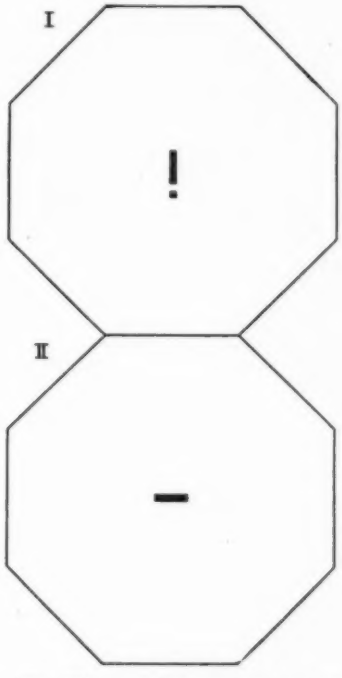


Fig. 20. The "Line point" illiterate test of Wolffberg, 1915.

gular parallelograms. A plate from this test is shown in Fig. 25.

In 1900, Praun reasoned that because the clock was in common use and a familiar object to everyone a design of the two hands in various positions would be a valuable test object. He followed up the thought by constructing and publishing

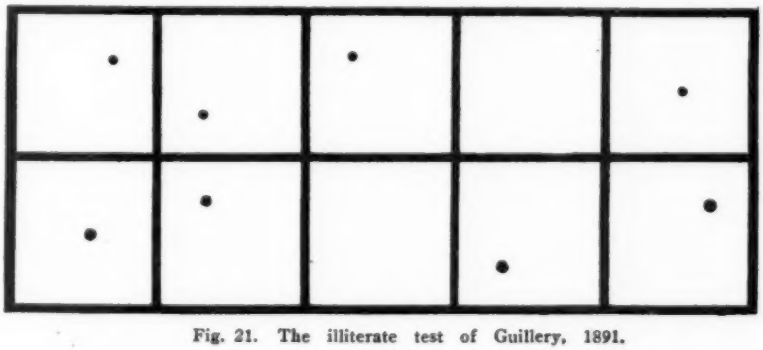


Fig. 21. The illiterate test of Guillery, 1891.

a series of test objects on this plan; using the one minute angle for the thickness of the line, a four minute angle for the length of the short hand of the clock, and a five minute angle for the length of the long hand as shown in the diagram, Fig. 26. The test was to locate the position of the hands.

In connection with an edition of test letters published by him in 1901, Von Ammon employed as an illiterate test the figure of Pergens modified by cutting away the corners of the blocked end of the test, as is illustrated in Fig. 27, his purpose being to equalize the black of the two ends of the test. It was employed by turning in different directions

No. 3. (Jaeg. ca. 6.)

Fig. 22. The illiterate near test of Guillery, 1891.

Fig. 23. The illiterate test of Pergens, 1893.

Fig. 24. The illiterate test of Albrand, 1894.

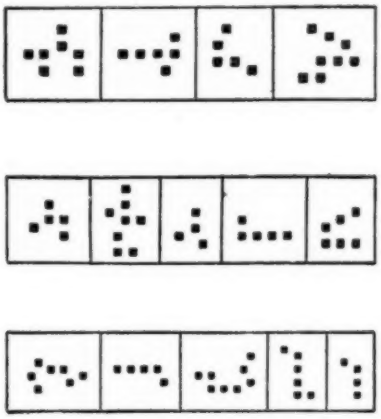


Fig. 25. The illiterate near test of Albrand, 1894

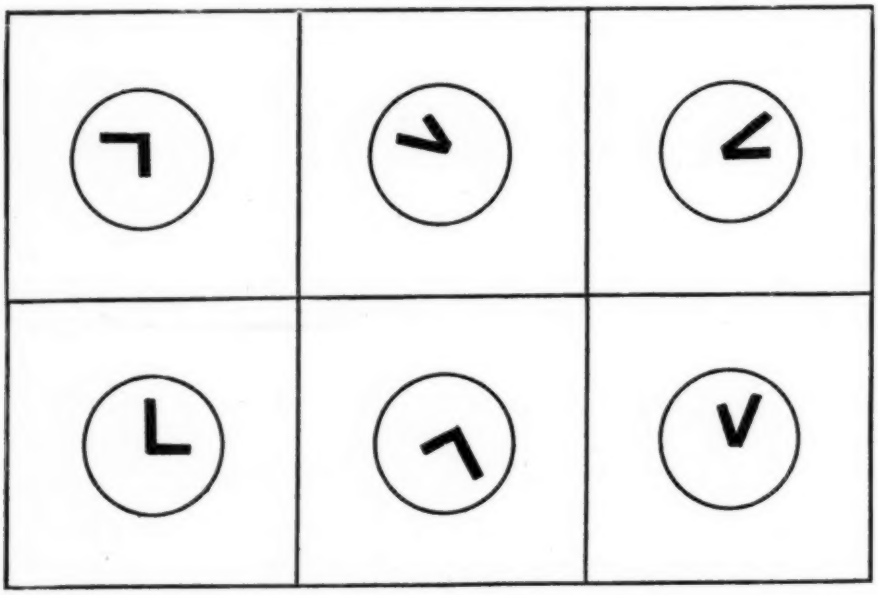


Fig. 26. The illiterate test of Praun, 1900.

as with the Snellen E. He also employed the Snellen formula.

In 1903 Heimann reintroduced for an illiterate test the hand with a pointing forefinger drawn on the one minute scale

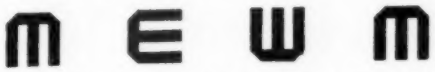


Fig. 27. The illiterate test of Von Ammon, 1901.

Fig. 28. The illiterate test of Heimann, 1903.

for the finger. The manner of using the test was by pointing the finger in different directions. This test is illustrated Fig. 28. As will be seen by consulting in Fig. 10, this test was first proposed by Albini.

In connection with his valuable work "Refraction," Dr. Thorington in 1908 published the miniature of an illiterate test card which was originated by him and included many new test objects. These test objects are illustrated in Fig. 29.

Dr. Ed Pergens introduced a set of primary tests in 1909 which consist of a visual unit in the form of a square for the purpose of determining position, position in connection with an angle, median aperture, aperture to the side, aperture at the corner, aperture at the peri-

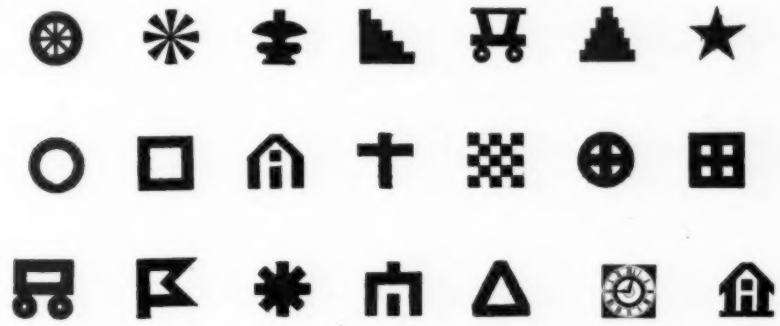


Fig. 29. The illiterate tests of Thorington, 1908.

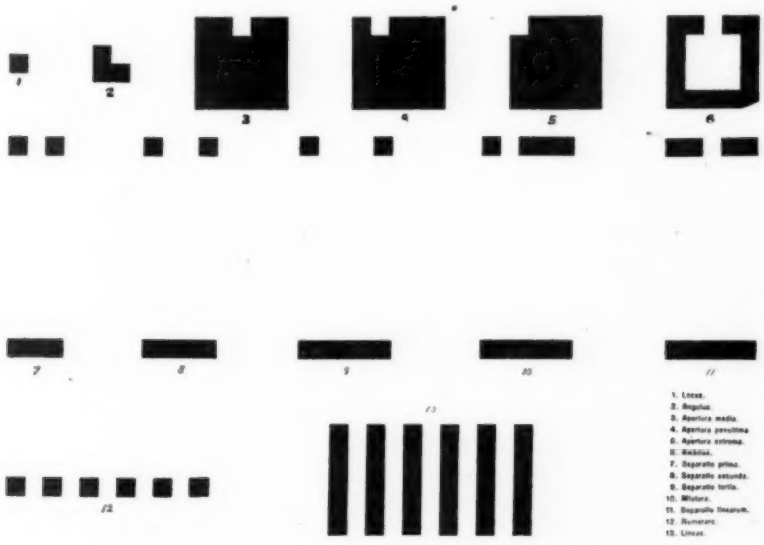


Fig. 30. The "Primary" tests of Pergens, 1909.

phery, primary separation, double or secondary separation, treble or tertiary separation, confusion separation, central linear separation, numerical point separation, numerical line separation, all on the basis of the one and five minute tangent. These are illustrated in the order named in Fig. 30. This is a valuable set of primary tests and they are beautifully and accurately executed.

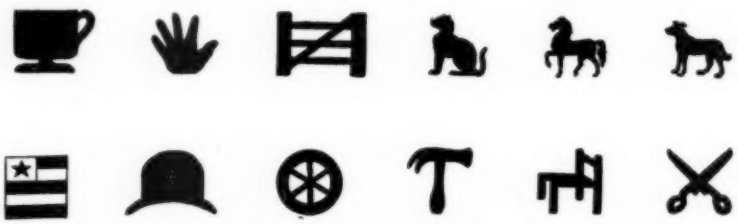


Fig. 31. The illiterate tests of Reber, 1911.

In 1910 Dr. Percy Fridenberg[14] introduced his "Stigmometric Card Test for Illiterates," which consists of group arrangements of the round dots of Longmore and Streidinger for the near test, and for the distance test the square dots first suggested by Snellen in 1862 and in 1870 employed by Boettcher in groups; the near tests with the Jaeger interval, and those for distance with the interval of Snellen, all on the one minute scale of Hooke.

Fig. 32. The illiterate test of W. G. McKinney, 1915, The American Railway Association. Employed in groups with one or more of the longer lines added.

A test card for illiterates was presented to the American Medical Association in 1911 by Dr. Wendell Reber, which contained several new test objects as may be seen from the accompanying illustration, Fig. 31.

In 1915 Dr. McKinney of the American Railway Association printed for the use of the Association a set of Snellen's one and five minute lines, using them in groups of two or more by shortening one of the lines to a four minute tangent as shown in the diagram, Fig. 32. The test for the patient was to select the shortened line in the group of lines.

With the purpose of producing a practical one and five minute uniform test which would be central, the author suggested to the American Ophthalmological Society, 1916, that a one minute break be placed in the central line of the three line one and five minute test of Snellen, this to be arranged with other three line one and five minute groups, the test being to select from the several groups the group containing the one minute break. This test has also proved useful in the detection of astigmatism, for which Snellen originally designed the three line one and five minute test. Examples of several arrangements of this central broken line test are given in Fig. 33.

Since the reading of this article, the Ophthalmic Section of the American Medical Association has adopted the recommendation of its Committee on the Standardization of Test Cards, which was published in the AMERICAN JOURNAL OF OPHTHALMOLOGY, February, 1919. This recommendation included a cut (Fig. 34) of the characters selected from all characters heretofore presented on this subject, and gave the following principles upon which the selection was based:

1. The lines of which the chief framework of the character is constructed should each subtend the angle of one minute.

2. The main body of the character should conform to the five minute visual angle.

3. Slight unobtrusive variations may be made in the lengths of the lines of the characters beyond the five minute angle in order to insure legibility, as it is prac-

tically impossible to construct pictures of ordinary well known objects in the five minute space with lines of one minute thickness.

4. Masses of black are undesirable.
5. Lines finer than would subtend the

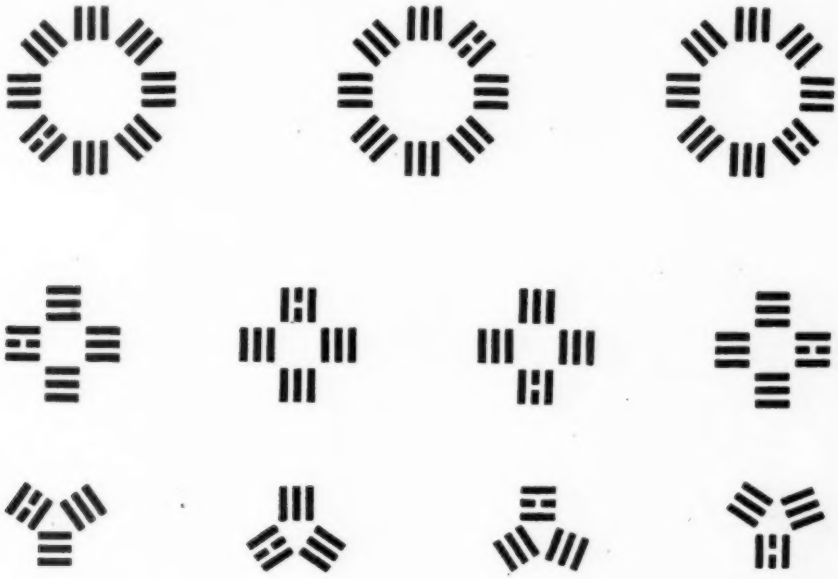


Fig. 33. The uniform central broken line test of Ewing, 1916.

angle of one minute are to be avoided in the body of the character.

Chronologically arranged the various steps in the development of the illiterate tests are:

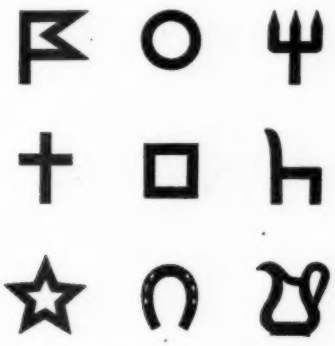


Fig. 34. Characters selected by the Ophthalmic Section of the American Medical Association as the best so far devised for illiterate test objects.

(1) 300 B. C.—Determination of the visual limit by Euclid.

(2) 1623 A. D.—Practical determination of vision by means of mustard seed and by use of print in the prayerbook. by Daça de Valdes.

(3) 1674.—The one minute visual angle established by Hooke.

(4) 1835-36.—Gradation of type, selection of light, selection of paper, and arrangement of pictures for testing the vision by Küchler.

(5) 1854.—Use of lines and spaces in logarithmic progression (= geometric progression) for determining visual acuity by Eduard Jaeger.

(6) 1860.—Employment of dots for testing the vision, by Longmore and Streidinger.

(7) 1866.—Employment of geometric forms of practically equal size by Snellen.

(8) 1870.—The introduction of one minute squares and one and three minute rectangles by Boettcher.

(9) 1773 to 1915.—Introduction of several so-called one minute tests in white, none of them central, Snellen

1873, Landolt 1888, Jackson 1891, Pergens 1893, Von Ammon 1901, Pergens 1909, McKinney 1915, Wolffberg 1915. Of these, that of Landolt, was selected as the standard visual test object by the International Ophthalmic Congress in 1909.

(10) 1910-1916.—Introduction of two central one minute tests in white, Wolffberg 1910, Ewing 1916.

(11) 1918.—Standardization of illiterate test objects by the Ophthalmic Section of the American Medical Association.

REFERENCES.

1. Euclides: Opera omnia, Heiberg and Menge, Leipzig, 1895, v. 12, p. 16.
2. Pergens: Annales dOculistique, v. 135, p. 120.
3. Daça de Valdez (L. Benito); Uzo de los Antojos para todo Genero de Vistas, Sevilla. Albertotti: Manoscritto francese del secolo decimosettimo riguardante l'uso degli occhiale, 1892. Memor. della R. Accad. di Sci., Lett ed Arti di Modena, Ser. 2, ix.
4. Lawson: Royal London Ophthalmic Hospital Reports, 1880, x, p. 79.
5. Tasadduk Husian: Indian Med. Gaz., v. 53, No. 1, Jan., 1918.
6. Birch: History of the Royal Society, 1757, London, v. 3, p. 120. Cf. Hirschberg: Ophthalmic Hospital Reports, 1876, v. ix, p. 16, ff. Hooke: Animadversions on the First Part of the Machina Coelistis of J. Hevelius, London, 1674. Posthumous Works of Hooke, 1705, p. 97.
7. Tauber, G.: Anweisung für Zuswärtige Personen, wie dieselben aus dem optisch-oculistischen Institute zu Leipzig Augengläser bekommen, Leipzig, 1816.
8. Jaeger, E.: Ueber Staar und Staaroperation nebst andern Beobachtungen, aus seines Vaters, Dr. Friedrich Jaeger, und aus der eigenen ophthalmologischen Praxis. Wien, L. W. Seidl, 1854.
9. Longmore: English Ophthalmic Manual, 1863, p. 11.
10. Marini: Giornale di medicina militare, Feb., 1875.
11. Albini: Camuset's Manuale d'Oftalmiatria.
12. Wolffberg: Analytische Studien zu Buchstaben und Zahlen zum Zweck ihrer Verwertung für Sehschärfeprüfungen, Graefe's Arch. f. Ophthal., v. 77, p. 409.
13. Wolffberg: Beiträg zür Sehschärfeprüfung nach Snellen, Graefe's Arch. f. Ophthal., v. 90, p. 249.
14. Fridenberg: Archives of Ophthal. v. 39, p. 227.

VENESECTION AS A PREVENTIVE FOR EXPULSIVE HEMORRHAGE.

ERNEST E. MADDOX, M.D.,

BOURNEMOUTH, ENGLAND.

In the case here reported this practical expedient was resorted to with complete success. Other points in the treatment of this case are also discussed in a way helpful to the practising ophthalmic surgeon.

The narration of the following experience may encourage, and perhaps guide some, to whom falls the unenviable task of extracting the remaining cataract, after the fellow eye has been lost by expulsive hemorrhage, that distressing catastrophe which happily occurs scarcely more than once or twice in an average ophthalmic surgeon's lifetime.

Mrs. C, aged 78, a patient of Dr. Kitchen of Parkstone, who had resided in Egypt and India most of her life, was subject to malarial fits, with high temperature, shivering, pains about the body and black fingers followed by perspiration. She had also a very pronounced myxedema with gout and chronic cystitis, so that expulsive hemorrhage was not to be wondered at, when her right cataract was extracted by one of the ablest and most esteemed of London surgeons, due of course to no surgical fault on his part. The bleeding commenced half an hour after extraction and continued for 2 days before the eye was enucleated.

It was his first case of such intraocular hemorrhage in a large experience, and he could not be persuaded to touch the other eye, in which there remained a cataract about three-fourths ripe, with a rigid iris, immobile to mydriatics. Feeling the greatest sympathy with him, and knowing that malarial affections of the choroid tend to be hemorrhagic, I was at first inclined to adopt a similar attitude, more especially as the patient retained vision of fingers at a yard, and there was still some clear cortex. The possibility of losing this sight and of plunging her into complete night and thus perhaps terminating her frail existence would have deterred me altogether, but for the "happy thought" of making venesection the first stage of the operation. I did a preliminary iridectomy, which was followed by an acute attack of gout in the foot, with malarial temperature reaching 103.4 and fluctuating from day to day. However, it eventually yielded to quinin. Eight days after the temperature had fallen to normal, she was brought again to the Nursing Home for the extraction of the cataract. Every precaution I could think of was taken; the operation being done in her own bed to avoid any movement afterwards. After mercurial purging, milk diet, calcium lactat, and (the night before) aspirin for her gout, quinin for her malaria and thyroid for her myxedema, I also gave on the morning of the operation bromid and morphia, with a hot turpentine stupe for the bowels to draw the blood thitherwards. The feet were kept sedulously warm, her head being also raised in bed.

The most important measure of all, however, was venesection immediately before the operation. As the veins at the bend of the elbow were entirely lost in myxedematous swelling, I selected a large vein in front of the temple, and cut it across obliquely making it bleed freely. I also pricked the distended episcleral veins on the eyeball, and the hyperemia of the eye became visibly less. An interesting result of this was that on cutting the flap it was quite bloodless, although adrenalin had been dispensed with, to avoid the secondary hemorrhage to which it predisposes. The coagulability of her blood was found to be very poor.

It might seem rash to choose the intracapsular mode of extraction for such a case, but the lens looked so sticky, and the iris so vascular and rigid (with T+1) as to make me fear

that gouty cyclitis would be sure to follow the retention of any sticky cortex in the anterior chamber. Yet on the other hand the danger of retroocular hemorrhage is undoubtedly greater after intracapsular than after classical extraction. I had to balance the two dangers and decided for the latter. After inserting a preliminary suture, as I am often accustomed to do, I extracted the lens in its capsule without loss of vitreous, with the aid of my little lens loop described elsewhere, and tied the suture.

The object of the suture was to secure rapid healing and refilling of the anterior chamber, before the circulation could reassert itself, and to limit the hemorrhage should it occur. Finally, a gentle compressive bandage was applied. The eye healed uneventfully, and though in a day or two its former hyperemia returned, no hemorrhage took place and the success was complete. She obtained vision, after correction, of 6/9 seven weeks later, and could not refrain from tears of joy, when, after so many anxious vicissitudes, she was first allowed to discover her return of sight. It was followed by a great improvement in health, and she may still be seen, nearly two years later, walking about the streets quite briskly, and to all intents ten years younger.

The very rigidity of the iris seems to have been an advantage, for the small coloboma retained its proper shape instead of being widened, as it so often is by intracapsular extraction. It is due to say that the unusual hazard of this operation (done on a dark New Year's morning, with the handicap of chillblained fingers) induced both the operator and his assistant to ask beforehand for help and it is pleasant to record the result.

Some of the hints, and especially the venesection, may be helpful to others confronted with similar difficulties, but the mode of extraction is narrated only as an incident suited to this special case, and not as a precedent to be lightly followed.

EXPERIMENTS ON THE EYE WITH GAS MANTLES OF DIFFERENT COMPOSITIONS.

C. E. Ferree and G. Rand.

BRYN MAWR COLLEGE.

This paper reports experiments made with Welsbach mantles of known size and composition as to the effect of the light they furnish upon the loss of efficiency and discomfort caused by a certain amount of eye work done under such illumination, with a discussion of the significance of these results.

In a preceding paper (see this journal April 1918, p. 252) it was pointed out that a belief seems to prevail among laymen and not a few medical and technical men that the kerosene flame as a source of light possesses advantages for the eye not had by other illuminants, more particularly by the incandescent solids. In that paper results were shown comparative of the effect of the following filament lamps on the power of the eye to sustain clear and comfortable seeing: the carbon lamp (metallized filament), the Mazda type B lamp, the Mazda type C lamp and the Mazda type C-2 lamp (blue bulb).[1] In the work of the present paper the comparative testing was continued. Welsbach gas mantles of different proportions of ceria and thoria were used, and the results obtained were again, for the sake of carrying out the original plan, compared with those gotten with the kerosene flame.

[1]Trade definitions: Gas-filled, *daylight* (blue) glass incandescent lamp, Mazda, C-2.
Gas-filled, clear glass incandescent lamp, Mazda C.
Vacuum, clear glass incandescent lamp. Mazda B.

The Welsbach mantle is an interesting illuminant from the standpoint of the effect on the eye, because of the change in its selectiveness of radiation with change in composition of the mantle. That is, by changing the proportions of ceria and thoria in the mantle a light can be obtained with its dominant color ranging from blue-green thru green, yellowish green, clear yellow and orange. The maximum candle power is obtained around 0.75 per cent ceria and 99.25 per cent thoria. The light from this mantle is an unsaturated yellowish green. With an increase of ceria the dominant color shifts towards that of the long wave-lengths; with a decrease of ceria, towards that of the short wave-lengths.

The direct incentive to the following experiments was a request made by certain members of the Illuminating Engineering Society, connected with the gas industries, that we test the effect of two mantles represented to us as commercial. Certain differences in effect were obtained. As a result a series of mantles was made for us, under their direction, to determine the effect of varying the proportions of ceria and thoria. We had no responsibility for planning the series, nor for arranging the details of the installation and operation of the units. All such matters were taken care of by them. The tests were made under their direction and all of the conditions from their side and ours were inspected before and during the course of the work, to see that justice was done. At the end of the work when all of the results were in, another inspection was made and conference held. The opinion was given that the tests had been conducted under fair conditions. The desire was expressed that the experiments be extended to include the testing a large number of observers as diversely selected as possible.

CONDITIONS TESTED.

The illuminants used in this series were the kerosene flame; two shortened "Ramie" Welsbach mantles, single mesh weave—one with 0.7 per cent ceria and 99.3 per cent thoria, the other with 2 per cent ceria and 98 per cent thoria; and seven "Ramie" Welsbach mantles, single mesh weave, of the size known as Junior mantles, having 0.25 per cent ceria and 99.75 per cent thoria. 0.5 per cent ceria and 99.5 per cent thoria, 0.7 per cent ceria and 99.3 per cent thoria, 1 per cent ceria and 99 per cent thoria, 2 per cent ceria and 98 per cent thoria, 3 per cent ceria and 97 per cent thoria and 5 per cent ceria and 95 per cent thoria.

For the sake of comparison with the kerosene flame, it might have been desirable to have conducted the tests with the gas illuminants equal to it photometrically, or approximately so, as well as with an equally illuminated reading page and test object. This was, of course, impracticable with the Junior mantles. To serve as a check on this factor, however, two of the mantles, the ones most commonly used, were shortened. They were cut to a length of 1.5 inches in order to make them as nearly as possible of the same candle-power as the kerosene flame burning at a height of 3 inches. Since the light from the top of the mantle differs in color value from that emitted from the middle and lower parts, this shortening of the mantle caused a change in the color value of the total flux of light. The effect of this change on the coloration of the reading page was quite noticeable. For example, in the mantle having 0.7 per cent ceria and 99.3 per cent thoria, steadiness of pressure and freedom from flicker in the light emitted were secured by means of a Baylis low pressure automatic governor, weighted to give 0.25 inch water pressure. A further means of regulating the flow of gas and making small changes of pressure, if needed, was provided by inserting a gasoline needle valve directly beneath the Bunsen burner.

The same standard, one burner student lamp fixture, fitted with a gas burner, a dummy chimney, etc., was used as was employed in the preceding experiments. We were led, it will be remembered, to choose this particular

type of unit in part because the belief in the superiority of the kerosene flame for the eye is, in the minds of those we have questioned, associated largely with the lighting effects given by the student lamp; and in part because this lamp is well adapted to give the control of conditions under which we wish the first series of tests to be made. Care was taken to adjust the position of the shade so that it sustained in each case approximately the same relation to the mantle. The bottom of the shade was, for example, in all cases 25 cm. below the center of the luminous source. The lamp was placed behind and to the left of the observer in the position that was judged by several observers to give the conditions most favorable for reading. This position may be specified roughly as follows. The angle with the median plane of the observer made by a plane passing vertically thru the center of the unit was approximately 21 degrees; and the line in the latter plane connecting the bottom of the shade with the center of the reading page formed an angle of approximately 38.5 degrees with the horizontal plane passing thru the center of the reading page. The reading page was supported by a rack fastened to the upright to which was attached the mouth-board used by the observer in taking the 3-minute record before and after work. This rack was inclined at an angle of approximately 30 degrees with the vertical. To insure that the same amount of light fell on the reading page in each case, the brightness of the page was measured before and after work by means of a Sharp-Millar illuminometer with the test plate removed and calibrated to give readings directly in candle-power per square inch. The changes needed to give equality of illumination on the reading page were made by changing the distance of the lamp from the page. These changes in case of either the full length or the shortened mantles were small. The changes required, however, to equalize the full length with the shortened mantles were slightly greater. This means a slightly greater general illumination of the observer's field of view and a slightly different brightness of surroundings. That is, the mantles of higher candle-power placed at a greater distance from the reading page illuminated a larger field about the page than the mantles of lower candle-power. In making the changes of distance care was taken to keep the angle at which the light fell on the page in all cases the same.

Owing to the angle of direction of the light and the distance of the lamp, the test object had to be illuminated from a separate source. For this a Mazda, type B lamp and an Ivanhoe-Regent steel reflector of the intensive type, aluminum lined, were used, placed in front and to one side of the test object, at the distance and angle needed to give the required illumination. In order that the test object alone should be illuminated and not the surrounding wall, objects, etc., the opening of the reflector was covered and an oblong aperture was cut of the size and shape needed to give the desired cross-section of light. The position of this aperture in the opening of the reflector was chosen with reference to giving the greatest possible evenness of illumination of the test object. That is, the light was not taken directly from the lamp but from the most favorable part of the inner surface of the reflector. The test object was made to match the reading page both in brightness and color value. The match in color value was secured by means of thin gelatin filters covering all or part of the aperture. If only a part of the aperture was covered, the filter was used as a diaphragm with an opening similar in shape to the original aperture. There was, for example, enough difference in the color value of the different illuminants and the Mazda lamp that without this match an after-effect was given on the test object distinctly different in color from the reading page. This would have necessitated that the final 3-minute record be taken in part at least with a test object having a coloration complementary to the reading page, which

would not have been compatible with the purpose of the test. Before beginning each test of the series, the eye was allowed the customary adaptation period without work under the illumination to be tested. The choice of the length of adaptation period was empirical based on a series of acuity tests, the object being to determine a period the prolongation of which gave no further change in acuity.

As was the case in the former experiments an opaque shade of the same size and design and with a neutral lining was substituted for the green shade with which the student lamp is usually provided. That is, it was considered advisable to conduct the test with the color value proper to the illuminant, unmodified by the light which filtered through the shade even though the position of the lamp was such that a very small part of the light which fell on the reading paper was of this origin.

The reading page illuminated by the different light sources had the following color values: the kerosene flame, orange-yellow; Welsbach mantle, 3 per cent ceria, 97 per cent thoria, unsaturated, clear yellow; Welsbach mantle, 5 per cent ceria, 95 per cent thoria, reddish-yellow more saturated; Welshbach mantle, 2 per cent ceria, 98 per cent thoria, unsaturated yellow with a trace of green; Welsbach mantle, 1 per cent ceria, 99 per cent thoria, unsaturated yellow with more green; Welsbach mantle, 0.7 per cent ceria, 99.3 per cent thoria, unsaturated yellowish green; Welsbach mantle, 0.5 per cent ceria, 99.5 per cent thoria, greenish with perhaps a trace of yellow; Welsbach mantle, 0.25 per cent ceria, 99.75 per cent thoria, bluish green. These estimates of color value are based in part on a direct comparison with color standards, in part on the filters that had to be used to make the color match between the test object illuminated by the Mazda type B lamp and the reading page lighted by the illuminant to be tested. We have not as yet made a standard colorimetric or spectro-photometric determination.

The tests were conducted in a room 16 ft. 6 in. (5.03 m.) long, 11 ft. 9 in. (3.58 m.) wide, and 9 ft. 6 in. (9.98 m.) high. A photograph of the room with an observer, lamp and recording apparatus in position are shown in Fig. 1 of the preceding paper, this Journal, April 1918, p. 254. The recording apparatus and the fixtures for lighting the test object were, as before, screened from the observer's view.

For a detailed statement of the care that has been exercised in the selection and use of observers and the precautions that have been taken to secure reproducibility of results and to check up the influence of variable extraneous factors by means of careful determinations of the mean error of the observations both in the 3-minute records and the 3-hour tests under the several conditions, see pp. 255-257 of the preceding paper; also Transactions of the Illuminating Engineering Society, 1915, X, pp. 1122-1130 and various places in other preceding papers.

The results for the effect on the eye are given in Table I. The values given in this table are averaged in each case from the results of a number of three hour tests. In order to show the reproducibility of the results obtained and to determine whether the variations produced by the changes in lighting effects are safely in excess of the variations in the test itself, subject to all of the variable factors which may influence it, the mean variation from the average result has been computed in each case. The value of these in per cent is given in columns 12 and 13 in Table I. This value has been estimated in two ways. In column 13 it is based on the result sought, namely, the mean value of the drop in ratio of time seen clear to time seen blurred. Computed in this way the results indicate whether or not each individual determination has been made with an acceptable degree of precision as compared with other work of its class. In column 12 it is based on 3.5, the value of the ratio of time clear to time blurred which has been chosen empirically as the standard of performance of the eye in the 3-minute record be-

fore work. Computed in this way the results appear in a form from which it can readily be determined whether or not the work has been done with a degree of precision which is acceptable for the comparative work which is the special purpose of these experiments. That is, to be acceptable in this regard, the variations of the drop in ratio caused by changing the conditions to

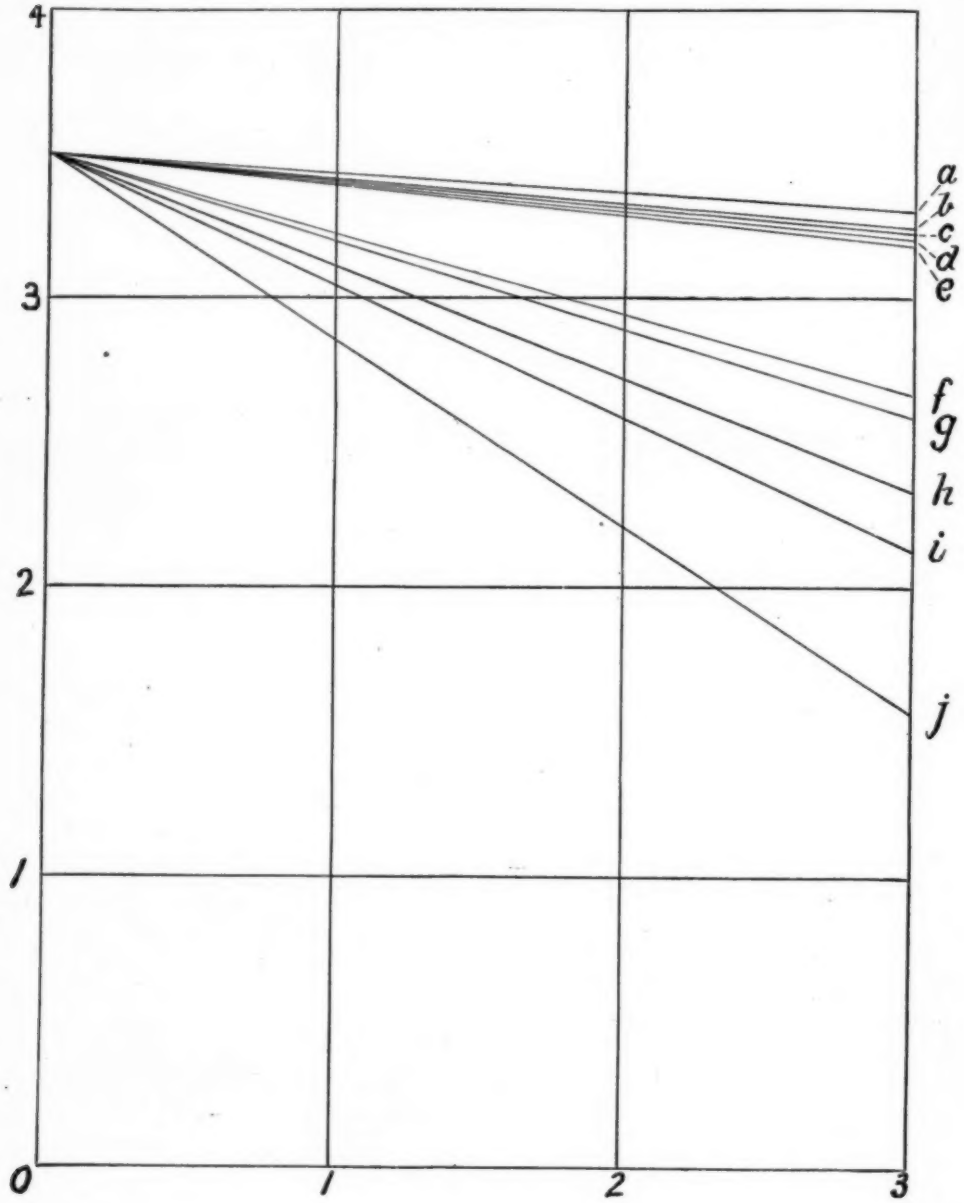


Fig. 1. Tendency of different illuminants to cause loss of visual efficiency (Figures on left) in three hours (Figures at bottom): (a) 3% ceria, 97% thoria. (b) 5% ceria, 95% thoria. (c) 2% ceria, 98% thoria. (d) kerosene flame. (e) Short mantle, 2% ceria, 98% thoria. (f) 1% ceria, 99% thoria. (g) short mantle, 0.7% ceria, 99.3% thoria. (h) 0.7% ceria, 99.3% thoria "Junior mantle." (i) 0.5% ceria, 99.5% thoria. (j) 0.25% ceria, 99.75% thoria.

be tested, must in each case be safely in excess of the mean variation. To make this comparison convenient, the drop in ratio and the mean variation have both been estimated on the same base, 3.5.

In Fig. 1 a graphic representation is made of the results in Table I. In constructing this chart the total length of the test period is plotted along the abscissa and the ratio of the time the test object is seen clear to the time it is seen blurred is plotted along the ordinate. Each one of the large squares along the abscissa represents one hour of the test period; and along the ordinate an integer of the ratio. In Fig. 2 a composition of mantle is plotted against loss of efficiency or power to sustain clear seeing expressed in per cent; Fig. 3 against tendency to produce discomfort. The results for the shortened mantles are not represented in these charts:

As formerly the work was concluded by determining for the different illuminants used the relative tendencies to produce discomfort with the eye at work. A description of how the determinations were made and a discussion of the method that was used have been given in previous papers. The results are given in Table II. In this table are given also for the sake of comparison results expressing the tendency of each type of illuminant to cause loss of ability to sustain clear seeeing. A graphic representation of the results of Table II are given in Fig. 3. Here as in Chart A the results of the test are plotted against composition of mantle.

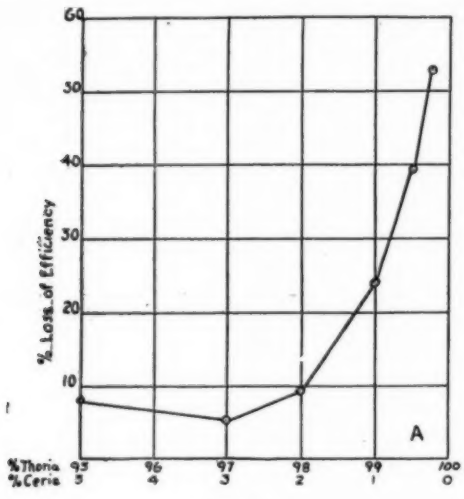


Fig. 2.

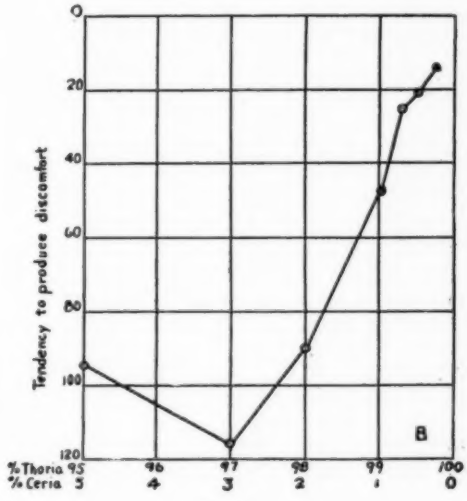


Fig. 3.

Showing a comparison of the tendency of the different illuminants to cause loss of visual efficiency, or power to sustain clear seeing and to produce ocular discomfort. In Fig. 2 composition of mantle is plotted against loss of efficiency; in Fig. 3 against the tendency to produce discomfort.

COMMENTS.

(1) That the foregoing results are due to differences in the color value of the illuminants used is perhaps a natural inference. This inference is strengthened further by a comparison of the results obtained in this and the work of the former paper on the electric units. However, a question may be raised whether they are due to color value alone. The conspicuous variables in these experiments have been composition of light (a physical variable) and color value (a sensation variable). It is scarcely needful to point out that, while closely related, these two variables are not synonymous nor do they always go hand in hand. For example, white light, so far as sensation is concerned, may be produced in any of the following ways: (a) by

TABLE I.

Showing the tendency of the different illuminants to cause loss of visual efficiency or power to sustain clear seeing.

Type of Illuminant	Dominant Color	Brightness (Cp. per sq. in.) Test object	Brightness (Cp. per sq. in.) Reading page	Time	Working distance (cm)	Total time clear (sec.)	Total time blurred (sec.)	Total time clear ÷ total time blurred	Ratios reduced to common standard	Loss of efficiency expressed in percentage change of ratio	Mean variation (Per cent) Based on 3.5	Mean variation (Per cent) Based on result sought (drop in ratio)
Welsbach mantle, 3% ceria, 97% thoria	Unsaturated, clear yellow	0.003168	0.003344	9 AM.	58	140.0	40.0	3.50	3.50	5.43	0.286	5.26
				12 M.	58	138.25	41.75	3.31	3.31			
Welsbach, mantle, 5% ceria, 95% thoria	Reddish-yellow, more saturated	0.003168	0.003344	9 AM.	60	140.0	40.0	3.50	3.50	7.57	0.2257	2.98
				12 M.	60	137.50	42.50	3.235	3.235			
Welsbach mantle, 2% ceria, 98% thoria	Unsaturated yellow with trace of green	0.003168	0.003344	9 AM.	60	144.0	36.0	4.00	3.50	8.29	0.390	4.69
				12 M.	60	141.50	38.50	3.67	3.21			
Kerosene flame	Orange yellow	0.003168	0.003344	9 AM.	60	139.17	40.83	3.408	3.50	8.39	0.323	3.84
				12 M.	60	136.33	43.67	3.122	3.2063			
Welsbach mantle, 2% ceria, 98% thoria (shortened)	Unsaturated yellow with trace of green	0.003168	0.003344	9 AM.	60	142.40	37.60	3.787	3.50	8.48	0.3828	4.52
				12 M.	60	139.70	40.30	3.466	3.2033			
Welsbach mantle, 1% ceria, 99% thoria	Unsaturated yellow with more green	0.003168	0.003344	9 AM.	60	141.0	39.0	3.62	3.50	24.00	0.571	2.38
				12 M.	60	132.0	48.0	2.75	2.66			
Welsbach mantle, .7% ceria, 99.3% thoria (shortened)	Unsaturated yellowish-green	0.003168	0.003344	9 AM.	60	139.33	40.67	3.426	3.50	25.51	0.250	0.97
				12 M.	60	129.33	50.67	3.552	2.607			
Welsbach mantle, .7% ceria, 99.3% thoria	Unsaturated yellowish-green	0.003168	0.003344	9 AM.	60	139.50	40.50	3.444	3.50	33.14	0.860	2.59
				12 M.	60	125.50	54.50	2.303	2.34			
Welsbach mantle, .5% ceria, 99.5% thoria	Greenish (perhaps trace of yellow)	0.003168	0.003344	9 AM.	60	142.0	38.0	3.737	3.50	39.14	0.857	2.19
				12 M.	60	125.0	55.0	2.273	2.13			
Welsbach mantle, .25% ceria, 99.75% thoria	Bluish-green, more saturated	0.003168	0.003344	9 AM.	60	142.35	37.65	3.781	3.50	54.86	0.690	1.25
				12 M.	60	113.50	66.50	1.707	1.58			

TABLE II.

Showing a comparison of the tendency of the different illuminants to cause loss of visual efficiency and to produce ocular discomfort. The tendency to produce discomfort is estimated by the time required for just noticeable discomfort to be set up.

	Dominant Color	Brightness (Cp. per sq. in.) Reading page	Percent loss of efficiency	Mean variation (Percent)	Time threshold of discomfort in seconds (reading)	Mean variation (Percent)	Change produced by changing type of illuminant (Percent)
Welsbach mantle, 3% ceria, 97% thoria	Unsaturated yellow	0.003344	5.43	0.286	116.0	1.30	
Welsbach mantle, 5% ceria, 95% thoria	Reddish-yellow, more saturated	0.003344	7.57	0.2257	94.0	1.07	18.97
Welsbach mantle, 2% ceria, 98% thoria	Unsaturated yellow, with trace of green	0.003344	8.29	0.390	90.0	0.83	4.26
Kerosene flame	Orange-yellow	0.003344	8.39	0.323	90.0	0.55	0.0
Welsbach mantle, 2% ceria, 98% thoria (shortened)	Unsaturated yellow, with trace of green	0.003344	8.48	0.3828	90.0	0.55	0.0
Welsbach mantle, 1% ceria, 99% thoria	Unsaturated yellow, with more green	0.003344	24.0	0.571	48.0	1.04	46.67
Welsbach mantle, .7% ceria, 99.3% thoria (shortened)	Unsaturated yellowish-green	0.003344	25.51	0.250	34.0	2.94	29.17
Welsbach mantle, .7% ceria, 99.3% thoria	Unsaturated yellowish-green	0.003344	33.14	0.860	25.0	2.00	26.47
Welsbach mantle, .5% ceria, 99.5% thoria	Greenish (perhaps trace of yellow)	0.003344	39.14	0.857	21.0	3.50	16.00
Welsbach mantle, .25% ceria, 99.75% thoria	Bluish-green	0.003344	54.86	0.690	14.0	2.36	33.33

combining complementary spectrum bands; (b) by combining larger groups of complementary wave-lengths; (c) by combining all of the wave-lengths in proportions balanced for the eye; and (d) by raising to very high intensities lights of any composition. Further any one who is familiar with the phenomena of color mixing knows that lights of different composition may be sensed of the same hue and saturation. Would white light of different compositions have the same effect on the power of the eye to sustain clear and comfortable seeing? Similarly would the eye stand up equally well under colored lights of the same hue and saturation but of different compositions? We would point out that daylight in reaction to which, roughly speaking, the human eye has developed, is what might be termed a full spectrum light. Would the eye sustain its functional powers as well and as comfortably under every light which matches it in color value even though synthesized from complementary spectrum bands or larger groups of complementary wave lengths? We are not at present prepared to say. It is safe to conclude, however, that they would not be of equal service for color matching, nor is it reasonable to suppose that they would be of equal value for the varied purposes of seeing. The same, we think, might be said of mixed colored lights matching in hue and saturation but differing in composition. If a decision is wanted as to the relative effect of color value and composition of light the results should be correlated with both of these variables. Since we are not prepared at this time to give a distribution curve for each of the mantles used, we have preferred to plot the results against composition of mantle, leaving a decision as to factors an open question.

(2) Differences in composition of light may, it is conceivable, affect the power of the eye to sustain clear and comfortable seeing in any or all of the following ways: (a) They may affect the resolving power of the eye. Experiment has shown that spectrum lights give a higher visual acuity than mixed lights of the same color. It seems quite possible also that variations in the composition of mixed colored lights may affect the sharpness

of focusing. (b) They may exert an immediately deleterious or irritating action on the delicate structures of the eye. For example, before beginning the work on the different illuminants we had planned a series of experiments on composition and color value of light, using 100-watt lamps, Mazda, type B, dipped in red, yellow, green and blue dyes, indirect installation. The coating of the lamps was sufficiently dense to give walls, ceiling, reading page, etc., of strongly saturated colors. The green was used first. After an hour of exposure to this light the eyes had suffered severely. The sclera had become injected and so much discomfort was experienced that the plan of using saturated colors was for the time being abandoned. So trying was the experience that some time had elapsed before the eyes had regained their normal appearance and comfort. The red, at a later trial was worse than the yellow but not so bad as the green.[1] The blue has not yet been tried. (c) They may have an effect on acuity thru the color of the sensation aroused. The reading of black letters on a page which presents any considerable degree of coloration is a peculiarly baffling experience. There is an unclearness which is not the blurring of bad focusing or of faulty fixation, but which seems to be a matter of ease, or rather the lack of ease, with which the details of the retinal picture are discriminated. Unclearness or difficulty of discrimination, from any cause whatsoever, leads reflexly to muscular effort towards a corrective readjustment which of course in the cases under consideration comes to naught and only induces fatigue.

(3) In general, if one were willing to draw conclusions with regard to composition and color value of light at this stage of the investigation, he would be inclined to say that in case of a given color the power of the eye to sustain clear and comfortable seeing decreases with the saturation of the color; but that independent of saturation some colors affect the eye more than others, namely, a displacement from white towards a dominance of the short wave-lengths of the spectrum affects the eye more than a similar displacement towards the long wave-lengths. For example, a yellowish or reddish yellow light affects the eye less than a greenish yellow, a green or a blue green of equal or even lesser saturation.[2] For the sake of confirming the above results it is our purpose to extend the work to include the testing of the effect of these variations in color obtained in other ways.

(4) In considering the relative merits of illuminants the comparatively low surface brilliancy of the gas mantle should not be forgotten. This fact is of a great deal of practical importance in the problem of providing adequate shading for the eye.

(5) In connection with the problem of shading we would recommend that the 0.75 per cent ceria mantle and other mantles of low ceria content be used with shade so selected that its color effect is corrective of the greenish coloration of the light given by these mantles. An examination of sales' reports shows that there is a growing popular tendency to use the "Standard" Welsbach mantle with an amber shade. The amber shade should exert in some measure a corrective action on the greenish light of the "Standard" mantle and is according to our results a movement in the right direction so far as the hygiene of the eye is concerned.

[1] The greater tendency of green to produce discomfort than yellow, reddish yellow and red has been reported also by different observers in our laboratory, working on problems involving long exposures of the eye to spectrum lights. However, we are far from denying the possibility of individual differences in this regard.

[2] As might be expected, our best results thus far in the testing of illuminants have been obtained with daylight. By this we mean natural daylight, not any of the attempts to simulate daylight artificially. In this latter connection our results with the type C-2 Mazda lamp may be called to mind.

ROLE OF FOCAL INFECTIONS IN SYMPATHETIC OPHTHALMIA.

CLINTON T. COOKE,

SEATTLE, WASHINGTON.

This paper sets forth an hypothesis of the connection of focal infections with sympathetic ophthalmia, cites the writings of others that seem to support this view, and reports in abstract five illustrative cases. Read before the Pacific Coast Oto-Ophthalmic Society, August 6th, 1919.

The object of this paper is to call your attention to a possible relation between certain cases of sympathetic ophthalmia and focal infection notably of the apices of the teeth, the so-called apical abscesses.

The resemblance of certain of these cases is so close to certain other cases of serous iridocyclitis with focal infections as an admitted etiologic factor, that I am unable to see any substantial difference between them except the history on the one hand of a perforating injury of one eye preceding by a certain interval of time the outbreak in the second eye, and on the other hand the absence of such history.

I desire to place before you a working hypothesis of the pathogenesis which is based upon the work of many ophthalmologists and which, while it recognizes the etiologic rôle of focal infections in the production of sympathetic ophthalmia, gives a different evaluation to anaphylaxis from any I have been able to find in the literature accessible to me.

I submit the following sequence of events as enabling us to understand and explain the occurrence and course of sympathetic ophthalmia. It is of course hypothesis, not a statement of settled pathology.

First. A focal infection.

Second. A trauma of the eye with microbic implantation in the uveal tract of bacteria similar to those in the focal infection, or of a variety which by change, in oxygen pressure for example, may by transmutation become similar.

Third. A time interval during which sensitization of the uveal tract occurs.

Sensitization by (a) Local specific defense by first a zymogen with specific ferment and a splitting of the bacterial protein in the exciting eye. (b) Predilection for the uveal tracts.

Fourth. Escape "in sufficient numbers" into the circulation of bacteria either from the first eye or from the focal infection.

Fifth. After sensitization a continuous or intermittent supply of bacterial protein of the same sort which has sensitized the second eye, causing an anaphylactic inflammation by a process somewhat analogous to Arthus's phenomenon, but not the same.

To those of us not familiar with Arthus's phenomenon this abridged description gives the principal points.

If a rabbit is sensitized by the subcutaneous injection of horse serum every six days, the first few injections will be absorbed in a number of hours. The fourth injection produces a soft infiltration which is not absorbed before two or three days. The fifth injection causes an edematous infiltration which is harder and is not absorbed before five or six days. The sixth injection produces a white solid compact subcutaneous mass which persists for weeks and the seventh causes the skin over the subcutaneous mass to become red then pale and begins to dry, a spot of gangrene develops which produces a refractory ulcer. These results remain the same when the injections are given in different localities or when all but the last are given in different localities or when all but the last are intraperitoneal.

Sixth. Sensitization of the second eye, having occurred thru and by reason of predilection the antigen, to use Ehrlich's term, could come conceivably either from the focal infection or from the exciting eye which would suggest the necessity for removal of both the exciting eye and the focal infection and which moreover would explain why removal of the exciting eye alone has failed so sadly to save the

sympathising eye once the uveitis has become established.

Taking this sequence of events seriatim: Billings defines a focal infection as a circumscribed area of tissue which is the seat of an infection of pathogenic microorganisms.

Such an area as you know may be located nearly anywhere in the body. If primary it usually communicates with a mucous or skin surface. It may spread by contiguity or become secondary thru the blood or lymph channels. The eyeball itself may become either a primary or secondary focus, as, for example, in a panophthalmitis following a wound or a metastatic choroiditis; and as such itself disseminate bacteria and toxins, having a perfect predilection for ocular tissues.

The effects of a focal infection depend upon whether or not the pyogenic or nonpyogenic bacteria are present, also upon the location and therefore upon the successful local defense set up by the contiguous tissues. If the degree of success in erecting a wall of exudate about the focus is small there will be leakage, either of toxins or of bacteria or of both, into the circulation with results of course dependent upon the virulence and number of the bacteria, as well as upon the particular affinities of the strain, if it be streptococcus or pneumococcus, etc.

Bearing these pathologic considerations in mind let us then assume for the present the presence of a focal infection; for example, an apical abscess with streptococcus viridans as the invader. We might substitute a tonsillar crypt with streptococcus mucosus capsulatus if we choose.

The patient says he is perfectly well, feels no pain or tenderness about the tooth. The toxins and the streptococci are nevertheless leaking into the circulation either continuously or intermittently and of course may reach the uveal tract.

Why does not the patient invariably develop an iridocyclitis? Because among other things both the streptococci and the toxins are insufficient in number and virulence to get by the nonspecific defenses of the blood. Moreover the strain of streptococci may have no special affinity for uveal tissues, furthermore the bacteria may be insufficient in numbers to cause any local specific defense by the uveal tissues.

Assume now the implantation in the useal tissue thru a wound in one eye of a sufficient number of streptococcus viridans to set up an inflammation. If not in sufficient number or of sufficient virulence suppuration will not occur, but a so-called traumatic inflammation of greater or less degree. This inflammatory reaction is accompanied by leucocytic infiltration and the well known histologic changes. This histologic picture is not that of sympathetic ophthalmia.

If this eye, having been infected with streptococci, is inflamed a specific defense *in loco* is set up with leucocytic infiltration, and formation of a specific proteolytic ferment which splits the protein of the streptococcus (and probably its toxins).

The fixed cells of the uvea participate. They are sensitized, being rich in the specific proteolytic zymogen, or to use the language of Billings, the streptococci have a "specific elective pathologic affinity for the tissue," or else no resistance would have been encountered. If they were in sufficient number, therefore, the invader "excited a characteristic reaction and sequential train of morbid anatomic lesions."

Rosenow has been able by varying the oxygen pressure of his cultures to cause transmutation from streptococcus hemolyticus to pneumococcus, to mucous capsulatus, to viridans, also to change the virulence and elective affinities almost if not quite at will.

I assume such change is possible in an eye, i. e., that a strain having predilection for uveal tissue may be produced in one eye which will affect the other. What determines the production of such a strain I do not know. However Vaughan says "each foreign protein has its predilection tissue where it is largely deposited, whose cells it especially sensitizes and where it is disrupted."

This requires *time*. After a time in-

terval, injection of more of the foreign protein into a sensitized tissue will set up an anaphylactic reaction. What an anaphylactic inflammation in the eye is like we shall see presently.

Streptococci, or other bacteria escaping into the circulation, having an elective pathologic affinity for uveal tissue, escaping from the first eye, find their mother tissue nowhere else but in the second eye; they are there deposited, having been found in sympathetic ophthalmia by Angelucci, Limbourg, Levi and others. They especially sensitize the uveal tissue of the second eye. If now the supply is augmented by a supply from a second similar focus elsewhere in the body the conditions are met for an anaphylactic reaction if the numbers, and virulence and predilection are only sufficient. Conditions which we might believe to be rather rarely all fulfilled at one time and that the proper time.

So far much has been assumed, possibly on good grounds. Now let us lay aside assumption for a time and use facts.

Wibaut (loc. cit.) has produced, by anaphylactic means a nodular choroiditis, with lymphocytes and giant cells resembling the deposits in sympathetic ophthalmia. The method used was to inject freshly sterile horse serum into the vitreous of rabbits, and this produced no especial reaction. After a time interval of some fourteen days he injected intravenously a second dose of horse serum. This second injection was always followed immediately by a severe iridocyclitis.

Enucleation of the eye, after from twenty-four hours to three days, showed the appearance just mentioned, epithelioid lymphocytes and giant cells.

Following are some clinical facts in the histories of five cases, two of which met the classic diagnostic requirements for sympathetic ophthalmia.

CASES.

CASE 1:—H. R., planerman in box factory, age 37, first seen March 16th, 1912. Complained of blurring of his right eye, worse by artificial light, past ten days.

History:—Penetrating injury of left eyeball with gradual change in left eye since. Often red of late. Right eye began to blur about ten days or two weeks ago, constant now, no attacks of transient blurring or asthenopia before. Is recovering from a "cold" in the head with "crick" in the back of the neck (i. e. muscular rheumatism), no intolerance of light, no pain about the eye, no headache.

Present condition:—Vision 8/10 and J 1 at 15 cm. *right* eye, pericorneal injection, violet color, perforating vessels tortuous, dilated, dark colored, slight swelling of both upper and lower eyelids due, he says, to the "cold." Anterior chamber hazy, keratitis punctata. Posterior synechia. Pupil horseshoe shaped after atropin. Pigment cells on anterior capsule. Anterior portion of vitreous full of small opacities, no fundus details, reflex only, eyeball tender to pressure.

Left eye:—Phthisis bulbi, injection of bulbus, left eyeball tender also.

Diagnosis:—Plastic iridocyclitis, probably sympathetic. He was given local 1% atropin sol., one drop every four hours with hot fomentations.

March 18th, second day, he returned with irregular dilated pupil, showing dust like opacities over entire pupillary area, vision=8/13, enucleation of left eye advised. March 29th he returned with a note from Dr. Stillson to whom I had referred him on the 16th, confirming the diagnosis of sympathetic ophthalmia and advising enucleation which was accepted and performed at Minor Hospital March 30th, 1912. The enucleated eyeball showed a plastic inflammation. Tenonitis of recent date. Was not examined histologically.

April 26th, vision = 8/10 with cycloplegic skiascopy+1.50 and +1.25 not improved. April 28th, vision=6/6, June 1, 1912, vision = 8/6, patient very happy. Returns to work. Pigment dots on capsule still visible. Dec. 16th, 1913, conjunctivitis, vision = 8/8-1, argyrol. February 27th, 1915, thinks he is luetic. Wassermann negative. Sept. 16th, 1915, has been under antiluetic treatment since Feb. 27th. Sight is good, vision = 6/5, some vitreous haze but papilla fairly

clear. Excavation of papilla —5.00 D.

April 4th, 1917, vision impaired past week, V = fingers at two meters, atropin and dionin, X-ray of alveoli shows abscesses and pyorrhea, three or four teeth extracted. His dentist confirmed X-ray findings, saying that granulomas were present in one or two pus sacs. June 4th, under vigorous treatment vision cleared, can see spots of fundus thru vitreous haze, vision = 6/20. December, 1918, another attack of pericorneal injection, vision = fingers about two meters, X-ray shows apical abscess, tooth extracted, eye cleared up, vision = 6/13, remains comfortable and looks so at present, April, 1919. July, 1919, fundus easily seen, vision = 6/5.

CASE 2:— D. V. McE. Right eye injured by flying piece of steel which penetrated the eyeball, passing thru the cornea and lens, and was extracted by Dr. Würdemann thru the original wound of entrance. Following this a severe uveitis supervened, great pain but no plus tension. On account of atropin conjunctivitis Dr. Würdemann changed to scopolamin, the pain becoming violent, according to Dr. Würdemann, because of the inert scopolamin.

The patient asked for consultation and was turned over to me by Dr. Würdemann. I suggested radiography of his teeth which was accepted. Two apical abscesses were found together, with much pyorrhea and alveolar abscesses. The teeth were extracted, whereupon the violence of the pain began at once to subside and the eye gradually cleared up.

Examination of the right eye showed a 4 mm. scar in the pupillary area of right cornea, adherent band of lens capsule extending back to the pupillary border of the iris. The anterior chamber was hazy, the iris markings obscured, pupil slightly dilated; there was some punctate keratitis, injection of the entire conjunctiva, all three sets of vessels. Tension —1, eyeball very tender and much lacrimation and pain in, above and behind eyeball.

Left eye:—Pupil contracted, some violet pericorneal injection, eye intolerant of light, not especially tender, no satisfactory examination of the fundus could be made in either eye at this time, attempts at accommodation were painful and avoided by the patient, but when attempted caused left eye to become red and suffused with tears. No keratitis punctata or hazy anterior chamber in the left eye, tension normal to palpation. Eyeball not tender to touch. Diagnosis right eye, traumatic plastic uveitis. Left eye sympathetic irritation. This diagnosis was concurred in by Dr. Würdemann. Shortly afterward the patient was examined by a representative of an insurance company, who strongly advised enucleation of the exciting eye. This I declined to accede to until the results of treatment of the apical abscesses could be observed, these results being favorable. Local treatment was instituted by atropin, dionin and hot fomentations with alkalies internally. Fischer's solution by Murphy drip enema, also $ZnSo_4$ on account of Morax diplobacillary infection which was present, followed after a short interval with subconjunctival injections of .5% dionin solution. The eye cleared up, the left gradually ceased to water and the man returned to work.

Feb. 10th, 1919, vision right eye 6/20 with +10.00. Vision left eye 6/4 with + 1.00 ⌒ —0.37 cy. ax. 45. September 1, 1919, V. = 6/4 with correction. Eyes clear and comfortable.

This case is reported because I believe it shows the sort of case which will develop sympathetic uveitis if the local infection is not removed. I believe with the insurance examiner that this patient's left eye would have developed sympathetic ophthalmia in the ordinary course of events. Of course I cannot prove it.

CASE 3:—Reported only to show presence of a severe type of focal infection running concurrently with sympathetic ophthalmia. L. D. H., age 35, penetrating injury of right eye, January, 1916, followed by severe uveitis. After three weeks the eye was enucleated to save the left eye which was already the seat of a rather severe inflammation. This inflammation did not subside entirely after enucleation of the exciting eye, but continued a low grade uveitis. In order possibly to put a stop to this an iridectomy

was done in November, 1917, by Dr. Mattice, after which the eye was very sore and much inflamed for two months.

During the absence of Dr. Mattice in France I saw this patient, who at that time, July 29th, 1918, had plastic uveitis, the coloboma was filled with a whitish inflammatory exudate, occlusio pupillae also, vision = light perception? Tension —3; His mouth was very septic with a virulent pyorrhea which he said had been getting gradually worse the past two or three years. I believe early attention to this man's mouth would have saved his eye with vision.

CASE 4:—March 31st, 1917, Mrs. R. H., age 50, ocular history negative until three years ago, when right eye began to be inflamed, diagnosed as tuberculosis of cornea by a general practitioner, and treated for two years by tuberculin injections O. T. The inflammation gradually disappeared leaving the eye useless; vision light perception. Careful search by a competent internist now fails to show any evidence of present active tuberculosis. The right eye became somewhat inflamed again but no pain in it or headache. This inflammation, she states, is now gone, but three weeks ago the left eye began to be red and the sight to fail; some intolerance of light but no pain or headache. Examination of right eye shows slight pericorneal violet haze. A massive leucoma covers the lower three-fourths of the cornea. Thru the fairly clear portion, above, the pupil can be seen to be secluded. It resists atropin dilation. Iris markings not clear, some tenderness of the globe. Tension —1.

Left eye, injection of bulbar conjunctiva, slight edema of eyelids. Posterior annular synechia, which resists atropin dilatation, anterior chamber hazy; keratitis punctata, tension —2.

April 2, Clover leaf pupil, anterior chamber slightly clearer. Examination of mouth shows much bridgework and gold crowns. X-ray advised, but not accepted until April 7th, when the accompanying radiographs were made. Because she had just paid a $70.00 old dental bill she could not afford to have the teeth extracted she said, but after thinking it over she decided to do so. By June 5th, under dionin and atropin her descemetitis was slowly clearing, all her upper and two lower teeth were extracted. Inunction of lanolin hydrarg. 50%, hot fomentations and a course of subconjunctival injections of 5% dionin, brought about a gradual recession of the inflammation with slight improvement in vision.

About this time she began to develop an increasingly bitter opposition to the war program of the United States which caused her to seek other medical advice than mine, so that I lost track of her. This case fulfills the classic diagnostic requirements for sympathetic ophthalmia without trauma yet I cannot bring myself unreservedly to such a diagnosis. I feel that it was simply a case of double iridocyclitis, first one eye and then the other, produced by her focal infections.

CASE 5:—Mrs. B. April 3, 1916. Practice of Dr. Geo. W. Swift. She began to develop cataract in both eyes in 1910. In Sept., 1915, her left eye was operated on by Dr. MacWhinnie, three months later an irridocyclitis developed which destroyed the left eye. Urine negative, pulse slightly irregular. She has an arthritis in several joints.

On May 8th, 1916, the cataract was extracted by Dr. Geo. W. Swift, Dr. MacWhinnie assisting. Combined extraction right lens, no accident. On the second day afterwards she developed a rapid heart which soon improved under digitalin treatment.

May 15th she was allowed to return home. Eye still red, some cortical substance left. Anterior chamber deep, coloboma correct.

June 2nd, vision with +10.00 ⊃+3.00 c. ax. 15° = 4/10, clear vitreous and cornea, no spots. August 1st, slight capsular opacity needled. Dec. 5th, 1916, vision 5/10, with +10.00 sph.

July 30th, 1917, eye became painful one week ago and now can hardly see, tho better than last week. Feels no irritation in the eye. She has a low grade uveitis with contracted pupil. The coloboma is hard to make out. A plastic exudate has drawn the pupil upwards.

March, 1919, very small pupil. Sees to get about only with difficulty. X-ray of teeth shows pyorrhea alveolaris and several apical abscesses. These teeth

were extracted and appropriate treatment given to her pyorrhea.

May 16th. Eye white, comfortable, sight improving, health much better. When the uveitis has subsided it is hoped an iridectomy will improve her vision.

Diagnosis: Endogenous uveitis from focal infection. Case reported to show association of a focal infection with plastic uveitis showing immediate improvement on removal of the focal infection. I see no need to call this a case of sympathetic ophthalmia. Only a histologic examination of the eye could say whether or not nodular choroiditis with epithelioid and giant cells was present. "Plastic uveitis is no part of the sympathetic process per se. (Fuchs.)

Presence of giant cells and epithelioid lymphocytes in characteristic arrangement and distribution may be found in sympathetic ophthalmia at a certain stage, but undoubtedly cases of the disease occur in which these cannot be found. (Parsons.)

A case, in which the classic diagnostic points were all present, except the *histologic* findings, recovered following the discovery and removal of a focal infection after failure to cure by removal of the exciting eye. If it be objected that this case was cured by removal of the exciting eye and that iridocyclitis later was an entirely new affection, I answer, "How then is one to know save by postmortem histologic examination of the sympathizing eye whether one is dealing with sympathetic ophthalmia at all?"

The discovery and removal of a focal infection and the cure of an endogenous iridocyclitis thereby is so common an event that we must admit focal infection to be a possible etiologic factor of the highest importance. Wibaut's production of a characteristically grouped infiltrate of epithelioid and giant cells, by anaphylactic means, appears to the writer to solve the problem of the exciting eye.

The problem of the sympathizing eye is not far from solved when we grant the possibility of predilection. A split protein having predilection for uveal tissue, or a streptococcus having a predilection for uveal tissue can find its receptors, to use Ehrlich's term, nowhere else but in the sympathizing eye. Parsons' remark that, "It should not excite surprise to find pyogenic germs in the eye" and that "We should not mistake the granules of mast cells for bacteria" gives indirect evidence that bacteria are frequently present in the uveal tract. (See Fuchs on this point.) If this is indeed true we have only to find similar bacteria in the eye, and a focal infection at the same time, to uncover a condition ripe for an anaphylactic inflammation of the second eye.

That a focal infection, of a streptococcus viridans for example, is often present as the exciting cause of an iridocyclitis I believe fully. It should excite no surprise if a patient having a focal infection of this germ, or any other, receive a trauma to an eye, or a perforating trauma, deliberate or accidental.

Sympathetic irritation can scarcely be held either to decrease the liability to iridocyclitis in the presence of a focal infection or to increase the defenses of the second eye.

The inference by many authors that because panophthalmitis or suppurative choroiditis does not supervene we should rule out the pyogenic bacteria, is an illogical inference. Likewise the statement that because a long incubation period exists we must infer the action of a germ similar to the tubercle bacillus or spirochete, leaves the anaphylactic reaction altogether out of consideration.

All toxic protein products are not ptomaines. A comparatively innocuous protein may become toxic by a parenteral digestive splitting; as Vaughan has shown, and as Wibaut also has demonstrated by producting anaphylactic inflammation by horse serum.

The exciting eye in other words may itself assume the role of a focal infection and become in fact a focus of infection where the bacteria having predilection for uveal tissue are incubated. Moreover transmutation may occur there.

To my mind an endogenous septic endophthalmitis may occur in any eye at any time, trauma or no trauma, whenever there is present in the body a focus of infection from which toxins or bacteria can escape into the circulation. In a case of sympathetic oph-

thalmia it is not a question of removing the exciting eye only. We should remove not only one-half or three-fourths or seven-eighths of the poison or source of poisoning, but all of it. Having a case of uveitis we should search all the possible locations for focal infections and not be content with the removal of the focus which is located in the exciting eye.

CONCLUSIONS.

Sympathetic ophthalmia is an anaphylactic inflammation of the sympathizing eye.

Elschnig is right in so considering it, altho I cannot believe that such anaphylaxis is *always* caused by proteins originating in the digestive tract.

A focal infection caused by an invader similar to that implanted in the exciting eye furnishes the larger dosage required to determine anaphylaxis. (The sensitizing dose being always less than the determining dose.)

Besides the size of the dosage other factors enter into the process, such as predilection, virulence, and affinity of the bacteria.

In every endogenous uveitis the proteins of the septic emboli have already been subjected to, and perhaps modified by, the nonspecific defenses of the blood, as well as the specific defenses of the focal area, from which they may have escaped. This suggests a possible reason why the processes of local immunization are ordinarily operative, and that immunity not sensitization is the usual outcome in loco.

With the implantation, however, of bacteria from without which have not been so subjected or modified, having certain affinities, the establishment of a local defense creates predilection for this same tissue and the second eye is thus sensitized rather than immunized.

The focal infection now supplies the increased dosage required to bring about an anaphylactic reaction and after the time necessary to sensitize has elapsed the reaction occurs.

This hypothesis gives us a working guide as to what we may do for the patient, namely, give him the most minute search for focal infections.

VISUAL DEFECTS OF THE WEST POINT CADETS.

CAPT. KENNETH A. PHELPS, M.C., U. S. A.

MINNEAPOLIS, MINNESOTA.

This is a study based on statistics of the past six classes of the Military Academy, presented in tabular form.

The West Pointer is trained to be as nearly physically perfect as possible. He is carefully selected, physically, before he is admitted; and almost the only defect he is allowed to have on entrance is one of vision. The visual requirements are as follows:

For the Hyperopic: Vision must be 20/30 correctible to 20/20.

For the Myopic: Vision must be 20/40 correctible to 20/20.

For the Astigmatic: Vision must be 20/30 correctible to 20/20.

In all cases there must be no disease of the fundus.

This, from the start, means that more myopes are admitted than hyperopes (statistics show six to one). Myopia develops or becomes known during the course of the cadet more often than hyperopia (curiously enough the statistics show 6 to 1 here also). Hence the refraction problem is one dealing with myopia almost entirely, and probably, for this reason, the graduation requirements are 20/100 in each eye correctible to 20/20.

As the classes have increased in number it is interesting to note that the percentage of defects in vision, both at admission 10% and graduation 20%, have remained practically fixed. This shows that about the same relative number develop trouble in the cadet corps as were admitted with it.

The cadets' work during the summer is outdoor work, requiring good distant vision for firing on the range; and on practice marches for reading signals and, with the field glass, to pick up silhouette and moving targets. Without good vision he misses seeing the "enemy" and is unable to direct the fire of his men, either as to direction or range. The man in the ranks needs vision enough to make out rough landmarks. He does not need to see the enemy, as his target is designated for him by his officer.

In winter the cadet must study long hours, often over fine work such as higher mathematics and mechanical drawing, which requires more accurate vision than reading only. He recites daily and his standing depends on daily averages, so he must work.

These long hours of work produce a spasm of the ciliary muscle which might be mistaken for a pure myopia. In the Spring the vision is often 20/70 or less and after the Summer's rest from near work the vision comes up to 20/30 or 20/40. These cases are so frequent that it is not rare to hear graduates of West Point talk about the "pecular eye condition of the cadets at the Point." This condition is a permanent state of excessive tension of the ciliary muscle; and mainly affects myopic eyes, which, by it, are made to appear more myopic than they really are, and is distinct "from the continuous tension of the ciliary muscles in hypermetropes when overcoming their hypermetropia so as to see distinctly." (Fuchs p. 910.) We found no fundus lesions, no field changes and no tension changes in any of these cases, but all were in myopes, and in some there was an apparent decrease in the range of accommodation.

Owing to the need of each cadet being able to work each day, it is very hard for them to give up time to be refracted under atropin or to have atropin used as treatment. We adopted the plan of refracting every man with a known defect during the summer, and should one develop trouble later we had saved him the loss of time due to a cycloplegic.

At each graduation time we found 20% of the class with visual defects. One-fourth of these read 20/70 in one eye and 20/100 in the other, and another fourth could not read that much. All these men were accepted into the army as officers, and about half of them started in the Academy with defects of vision which progressed each year. Our figures show that 50% of the men who were admitted with vision below normal had progressively lower vision at each examination.

When a man reported for examination for admission and we found a visual defect, we felt that his chance of the defect progressing were "fifty-fifty," and almost no chance at all for improvement. One out of every ten men will develop trouble before he graduates.

In 1917 we found that the system of lights was very poor. Most of the men sat in a glare so the wearing of eye shades was almost universal, and at the same time they were working in shadows. Each man sat at his table with a light behind him, so arranged that it shone into the eyes of his room-mate. We had a better system put in and were hoping to have less trouble, when the size of the cadet corps was increased so that often four men were put into a room intended for two. This made it impossible to tell how much the improper lights had to do with the development and the progress of visual defects.

Much of this condition could be eliminated by a strict adherence to the entrance requirements which we believe should be 20/20 in each eye. Certainly no case not meeting the requirements should be placed on probation, for there is very little chance for improvement taking place to meet later requirements.

Summary of Visual Defects in Classes (1916-1921) Table I

	Total Defects	% Defects	Abnormal on admission								Normal on admission							
			No.	m	ma	cma	h	ha	cha	mx	No.	m	ma	cma	h	ha	cha	mx
Class of 1918: 142 men	27	19	13	7	2	3	0	1	0	0	14	2	1	6	0	4	0	1
Improved	..	..	..	..	..	..	..	..	..	..		2	0	0	0	0	0	0
Defect increased	..	..	..	..	..	..	..	..	..	..		0	0	6	0	2	0	1
No change	..	..	..	..	..	..	..	..	..	..		0	1	0	0	2	0	0
Class of 1919: 137 men	30	21.9	16	10	0	5	0	0	1	0	14	7	0	4	0	1	1	1
Improved	..		0	0	0	0	0	0	0	0		0	0	1	0	0	0	0
Defect increased	..		0	5	0	1	0	0	0	0		4	0	0	0	0	0	0
No change	..		0	5	0	4	0	0	1	0		3	0	3	0	1	1	1
Class of 1920: 237 men	34	14.3	18	13	1	0	0	1	3	0	16	6	1	7	1	0	1	0
Improved	..		..	1	0	0	0	0	1	0		0	0	1	0	0	0	0
Defect increased	..		..	9	0	0	0	0	0	0		4	1	4	0	0	0	0
No change	..		..	4	1	0	0	1	2	0		2	0	2	1	0	1	0
Class of 1921: 313 men	46	14.8	14	8	0	1	0	2	3	0	32	10	4	10	1	2	4	1
Improved	..		..	0	0	0	0	0	0	0		2	1	2	0	1	2	0
Defect increased	..		..	8	0	1	0	2	3	0		5	1	7	0	0	0	0
No change	..		..	0	0	0	0	0	0	0		3	2	1	1	1	2	0
Class of 1917: 2 years before graduation	11		6	4	0	2	0	0	0	0	5	0	0	5	0	0	0	0
Class of 1916: 126 men. 1 year before graduation	18	15.9	10	8	0	2	0	0	0	0	8	2	0	6	0	0	0	0

	1918		1919		1920		1921	
	Below at grad.	Just passed	Below at grad.	Just passed	Below at grad.	Just passed	Below at grad.	Just passed
Entered below requirements	0	2	5	0	4	2	0	2
Entered with defect, but passed requirements	1	2	1	2	1	2	0	7
Normal at admission	2	3	3	3	0	0	1	1
Totals	3	7	9	5	5	4	1	10
	10		14		9		11	

KEY TO TABLE I.

M—Myopia. Ma—Myopic Astigmatism. Cma—Compd. Myopic Astigmatism. H—Hyperopia. Ha—Hyperopic Astigmatism. Cha—Compd. Hyperopic Astigmatism. Mx—Mixed Astigmatism.

CYCLODIALYSIS.

H. S. GRADLE, M.D., F.A.C.S.,

CHICAGO, ILLINOIS.

The history and method of performing this operation, the manner in which it proves effective, the class of cases to which it is suited and the results obtained by it, are here discussed with six abstracts of illustrative cases, and a bibliography. Read before the American Academy of Ophthalmology and Oto-Laryngology, October 18, 1919.

HISTORY. In 1905 at the Heidelberg Ophthalmological Congress, Heine[1] first described an operation which he had performed twenty-six times for the relief of increased intraocular tension. He termed the procedure "Cyclodialysis," a name which has remained. The technic was set forth in detail as were the cases upon which it was tried, followed by a discussion of the modus operandi resulting in a balance of intraocular tension. This latter point will be set forth at length in the subsequent pages. The operation found favor immediately in the Continental Clinics, where it was tried extensively on all forms of increased tension. But in this country only a few operators attempted the procedure.

TECHNIC. The following are the steps of the operation:—

a.) Usual aseptic precautions with instruments, conjunctival sac, etc.

b.) Curvilinear incision of the conjunctiva, 8 millimeters long and 8-10 millimeters above the limbus.

c.) Free undermining of the conjunctiva toward the limbus.

d.) Tangential incision thru the sclera, 6 millimeters long and 6-8 millimeters above the limbus.

e.) Introduction of the cyclodialysis spatula thru the incision, hugging the inner surface of the sclera, while a forcible rocking motion thrusts the tip of the spatula into the anterior chamber.

f.) Free sweeping motion of the spatula to the right and left, forcibly

separating the adherent ciliary body from the sclera and freeing the chamber angle. Withdrawal of the spatula.

g.) Closure of the conjunctival wound with one or two sutures.

But few of these steps need detailed discussion. The incision of the sclera is the most delicate phase of the entire operation. In his earlier publications, Heine[1] advocated the use of a short keratome for this incision, but a very round-bellied, extremely sharp scalpel has proven more successful. The complete incision should not be attempted at one stroke for fear of injuring the underlying ciliary body; a more rational technic is a series of short light strokes that eventually separate the scleral fibers without impinging upon the ciliary body. Considerable bleeding accompanies this step and occasionally it is necessary to interrupt proceedings to stop the hemorrhage from the small scleral vessels with tampons soaked in adrenalin.

The introduction of the spatula is the most difficult step in the entire operation. It is absolutely imperative to keep the rounded tip well elevated and pressed tightly against the inner surface of the sclera, while a forward rocking motion wedges it into the anterior chamber. This step is painful, despite a prelimiary subconjunctival injection of cocain. Failure to adhere to this technic may lead to a perforation of the choroid or an injury to the ciliary body. Fridenberg[2] found that this constituted his greatest stumbling block in the operation. In case either of the above mishaps occur, partial withdrawal and adherence to the proper path will accomplish the desired result. That such an occurence is not necessarily dangerous may be seen from the following case:—

In 1909, this patient was treated for many weeks with the usual miotics. He had a well advanced glaucoma simplex, with a deep cup, vision almost nil and tension that remained around 60 mm. of Hg. On November 30, 1909, a cyclodialysis was performed. At the first attempt the spatula entered behind the iris and a trace of vitreous appeared in the wound. There was no undue reaction to the operation and the tension remained subnormal for about three months. It then rose to 47 mm. of Hg, but under miotics, quickly dropped to around 20 mm. of Hg, where it has remained to date. The tension of the eye has been taken every three or four months and it has never been found above 20 mm. of Hg.

Hemorrhage into the anterior chamber may or may not occur, depending upon whether a perforating scleral vessel has been injured or not.

As soon as the tip of the spatula appears in the anterior chamber, a lateral sweeping motion should be made, including at least one-third of the entire periphery and extending well back so as to free the chamber angle as well as separate the ciliary body from the sclera. Hemorrhage is bound to occur during this phase of the operation and it cannot be checked, but will cease of its own accord within a short time. If so desired, the anterior chamber may be emptied at this time, merely by depressing the entire spatula and allowing the bloody aqueous to flow out thru the scleral wound. But in case a retention of the anterior chamber seems advisable, as for example in a hemorrhagic glaucoma, the spatula should be pressed continuously against the sclera, thus keeping the path of exit closed. Upon withdrawal of the instrument, the path closes spontaneously.

The use of atropin following the operation depends upon the case. Should any indications of inflammation be present, a single drop may be advisable; but in the average case *where a cyclodialysis is indicated,* the use of atropin is superfluous. For a more detailed description of the operation, the reader is referred to Heine (1), (2), (3), Denman (4), and Meller (32.)

RATIONALE. The operation of cyclodialysis was conceived on a basis of Fuchs' work on the anterior choroid following cataract extraction. Heine believed that the operation would open a path of filtration from the anterior chamber into the suprachoroidal spaces, thus allowing of a slow absorption of the aqueous, (1), (2), (3), (5). But the fallacy of this theory was soon shown, partially by the experimental work on animals of Krauss (6), Judin (7) and (8) and Wichodzeff (9), and partially by

the study of operated eyes by Weekers (10), Heine (11), and Stock (12). Observations based upon animal experimentation alone are insufficient because of the different anatomic and pathologic conditions present, as was admirably shown by Wernicke (13). Pyle (22) considered that a cyclodialysis was effective because of a subsequent atrophy of the ciliary body, with accompanying decreased formation of aqueous. But today, the consensus of opinion is that the success of a cyclodialysis depends upon freeing the angle of the anterior chamber, opening the filtration spaces and allowing of a normal escape of the aqueous.

But in certain cases, probably of an inflammatory character, this mode of exit becomes closed, subsequent to the operation, and the cyclodialysis is termed a failure. In all liklihood, there exists an inflammatory formation of fibrin which clogs the filtration angle, and lodging there, becomes organized. But to determine a priori which cases will react in this manner is impossible. It is probable that the younger the individual is and the more inflammatory his reaction toward the known trauma of operation and the unknown etiologic factors of increased intraocular tension, the less will be the chance of a successful result of a cyclodialysis. The following case is illustrative of that point:—

In 1914, a young woman, aged 35, was refracted under homatropin and her right pupil remained dilated subsequently. When seen, three months later, her right pupil was 6 mm. wide and rigid. There was no excavation of the disc; the tension was 60 mm. of Hg.; the vision was 0.6. The usual miotic treatment was attempted for one month, but without success. A cyclodialysis was performed in April, 1914. One week later, the tension was 31 mm. of Hg. and it rose continuously for a month, when it registered 58 mm. of Hg. A corneoscleral trephining was then performed and the tension has remained normal ever since. The vision has remained at 0.6.

On the other hand, cyclodialysis has proven very successful following an iridectomy that has failed to reduce intraocular tension permanently. Such cases have been reported by Knapp (14), Denman (4), and Heine (11). In fact, Knapp (14) considers that the failure of an iridectomy to maintain normal intraocular tension constitutes the main indication for cyclodialysis. In these cases, the effect is probably due to the opening of the chamber angle, which was closed by organized adherence of the root of the iris.

Selection of Cases. Even more important than finished technic is the proper selection of cases upon which to perform the operation of cyclodialysis. Owing to the character of the operation and its modus operandi, *increased intraocular tension alone is not an indication for cyclodialysis.* This was not known during the first few years of the operation and many of the unfavorable results were due to injudicious selection. Witness, for example, the case reports of Stock (12), Elschnig (15), Boldt (16), Krauss (6), Judin (7), Meissner and Sattler (18), Waldstein (19), Morax and Fourriere (20), Knapp (14), and Heine (11).

In one of his later papers, Heine (23) laid down absolute indications and contraindications for the use of cyclodialysis in terms that cannot be improved upon: *"The more acute the glaucoma the more urgent the indications for immediate operation, the better will be the results of iridectomy; the more chronic the glaucoma and the less urgent the indications for immediate operation, the more favorable will be the results of a cyclodialysis."* Compare this with the indications pointed out by various other authors:

Knapp (14) considers cyclodialysis to be indicated in cases of advanced chronic glaucoma where an iridectomy has failed to reduce the tension. Stock (12) prefers to do a cyclodialysis in cases of chronic inflammatory glaucoma and glaucoma simplex, where from the character of the case, an operation is to be feared and he considers the operation merely as a preliminary to a subsequent iridectomy.

Elschnig (15) advises that in glaucoma simplex and in fresh inflammatory glaucoma, a cyclodialysis be tried

and if not successful, be followed by other operation; in all other types, it is the operation of choice. Zentmayer (24) recommends cyclodialysis in the operative treatment of absolute glaucoma.

Gradle (25) advocates a cyclodialysis in cases of glaucoma simplex on the basis that if successful, a maximum of good has been done with a minimum of harm; but if unsuccessful, there has been no bar introduced to the resort to further operation of greater severity. Posey (26) prefers a cyclodialysis if there is any evidence of hemorrhagic tendency, or if the visual field is reduced greatly.

Practically all operators have found cyclodialysis highly successful in noninflammatory absolute glaucoma. This has been particularly emphasized by Meller (17) and Zentmayer (24). The following is a typical case of this character:

An aged negro was seen with an absolute bilateral glaucoma. One eye was painful with tension of 75 mm. of Hg. A cyclodialysis was performed upon this eye and the tension promptly sank to normal where it remained for the seven months he was kept under observation.

Summed up briefly, the indications for cyclodialysis may be stated as follows:

1. Glaucoma simplex that has failed to respond to continued miotic treatment and in which there is but little evidence of an inflammatory reaction.

2. Borderline cases of chronic inflammatory glaucoma where an iridectomy is to be feared or where the visual field is greatly reduced.

3. Acute inflammatory glaucoma with a hemorrhagic tendency.

4. Noninflammatory absolute glaucoma.

5. Any case of glaucoma simplex in which a more severe operation is feared and which can be watched carefully for a long period of time.

6. Any eye with increased tension upon which an unsuccessful iridectomy has been performed.

The contraindications are less specific:

1. Acute inflammatory glaucoma.

2. Chronic inflammatory glaucoma of the exudative type.

3. Glaucoma simplex in a young individual which resists miotic treatment.

4. Buphthalmus.

RESULTS. Judging from the earlier reports, the results of cyclodialysis were not particularly favorable from the standpoint of immediate or permanent reduction of intraocular tension. Thus Stock (12) reported five cases with three failures; Weekers (10) recorded five successive failures. Krauss (6) condemned the operation on the basis of two unsuccessful cases, as did Judin (7). Morax and Fourriere (20) had poor results with one case and abandoned the method. An analysis of these cases will, however, explain the unfavorable figures, because in nearly every case, the operation was not based upon the proper indications or else was attempted as a stop-gap when repeated iridectomies had failed. This was clearly shown by Pyle (27).

A careful selection of cases in the hands of competent operators led to more successful results. Wernicke (13) found that among sixty-one cases observed for a period of two years, 57% were permanently improved and that in the cases where one eye was iridectomized and its fellow subjected to a cyclodialysis, the results were about equal. Ohm (28) was particularly successful in the two cases upon which he tried the operation. A drop of tension to normal with a marked improvement in central vision and visual fields was reported by Zentmayer (29) in three out of the four cases thus operated upon. Brown (30) had one case completely relieved by cyclodialysis. Three cases with results that were permanent during the period of observation were recorded by Denman (4). Elschnig (15) performed cyclodialysis one hundred and nine times on eighty-five eyes with permanent results in fifty-four of the eighty-five. Thirty-seven cases were operated upon by Boldt (16) and in thirty-one of them there was an improvement which proved permanent in twenty-five. Small (31) added one case to the number of good results reported. Meissner

and Sattler (18) made a careful study of fifty-four operations of cyclodialysis and reported 28% good results; as a good result they termed a case where the tension remained normal for six months or more and where the central vision remained equal or improved. One hundred and seventy-six cases were reported from the Elschnig Clinic by Waldstein (19) with approximately the same results as in the earlier Elschnig report. In his last paper, Heine (11) analyzed ninety operations upon seventy-nine eyes; in seven, there was no result; in twenty-three, there was a temporary result necessitating further operative interferences; in thirty-four, the result was good, but the period of observation was too short to call the result permanent; in twenty-six, the result was good for more than nine months. Meller (17) obtained permanent results in 40% of the cases, temporary relief in 30%, and no result in 30%.

From these figures, it can be seen that experienced operators who have tried the operation over a larger series of cases, have had fairly uniform results. The figures given by Meller (17) are somewhat lower than the average obtained by an analysis of the cases reported in detail. Thus sixteen operators presented three hundred and seventy-one cases with two hundred and eleven good results (57%), fifty-four temporary results (14.5%), and one hundred and six failures (28.5%). Absolute reliance cannot be placed upon these figures because some of the cases were not observed a sufficiently long time to insure their proper placing. This would tend to reduce the percentage of good results and increase the percentage of temporary results.

The operation cannot be properly adjudged by the results of any one operator, nor any series of operators unless certain set rules are observed; there must be a proper selection of cases; and the cases must be watched and studied for from six months to two years after operation. The proper selection of cases has been discussed, but the proper tabulation of results is equally important and the tabulation must be based upon the behavior of the central vision, the visual fields, and the intraocular tension.

After a successful cyclodialysis, an improvement in central vision is not to be expected because, in a case suitable for this operation, the impaired vision is due to pressure death of nerve fibres, and retinal elements, rather than to the active manifestations of pressure. Consequently, relief of increased intraocular tension can have no influence upon the degenerated nerve elements. If the operation is a success, the vision should show no further decrease, provided nutritional disturbances of the lens have not made their appearance. But if beginning opacity of the lens is present, it is not unusual for the opacity to proceed until it becomes complete.

A 67 year old man appeared with a glaucoma simplex of one year's duration. The vison was reduced to fingers at 2 meters, owing to lenticular opacities. The tension never was above 47 mm. of Hg. After miotic treatment for eleven months, a cyclodialysis was performed. The vision gradually decreased, altho the tension remained about normal. Fourteen months after the original operation, the tension rose to 40 mm, of Hg., but easily controlled by miotics. In view of the advancing opacity of the lens, an iridectomy was performed and through the resultant coloboma, it could be seen that the lens was completely opaque. The patient died of an intercurrent febrile complaint before the lens was extracted.

The behavior of the *visual fields* is influenced to a great extent by the same factors that control the central vision. The regular contraction of the field is due to the increased intraocular tension and its uniform pressure upon the periphery of the retina, whose fibres are subjected to increased pressure over a longer distance than are the fibres from the more central areas. This is shown by the fact that the visual field is contracted before an enlargement of the blind spot occurs. The irregular indentations in the visual field are due to the increased pressure upon the nerve fibres as they pass

over the edge of the cupped optic disc, pressure, as it were, upon a knife edge. If the increased pressure has existed a sufficient length of time to cause a death of these nerve elements, a successful cyclodialysis will not increase the size or regularity of the visual fields; on the contrary, there will be a slight decrease owing to the advancing atrophy which cannot be stopped merely by a resumption of normal intraocular pressure. On the other hand, if the increased pressure is of recent origin, a successful operation will restore the visual fields to approximately their normal condition, because in the early stages, the contractions are merely due to a pressure blocking (which would eventually lead to atrophy). Completed abolition of the central field, such as occasionally occurs after iridectomy, has never been reported as a sequel to cyclodialysis.

The intraocular tension is, after all, the most reliable index as to the success of an operation. It is undoubtedly true that the tension as recorded by any of the existent clinical tonometers is not the actual intraocular tension as measured by the proper manometer. But the difference between the tonometric tension and the manometric tension, for any one eye, is constant, and therefore the clinical tonometer is accurate in that it gives a comparative measure of the intraocular tension of an eye from one period to another. (Parenthetically speaking, with this thought in mind, it is to be regretted that a recently devised tonometer is provided with a scale that does not agree with those already established in clinical use, any more than it agrees with the absolute manometric tension.) Consequently, the measurement of intraocular tension for a period before and after operation furnishes a definite guide as to the behavior of the eye and the success or failure of the operation. After a successful cyclodialysis, the tension may drop immediately to subnormal, especially if the anterior chamber has been emptied during the course of the operation and may remain so for several months.

In 1907, a 36 year old woman was found to have a tension in the left eye that was questionably plus 1, but distinctly more than in the right. The disc was excavated with a sharp nasal border and slope on the temporal side. The vision was 20/70 and could not be improved. Under eserin, the tension did not change.

Three years later, she instilled a drop of atropin designed for her daughter. When seen three weeks later, there was a total cupping of the disc, the tension was 60 mm. of Hg. and the vision was 40/100. Efforts were made for three months to control the disease with miotics and subconjunctival injections of sodium citrat, but without avail.

A cyclodialysis was finally performed, following which the tension sank to 11 mm. of Hg., where it remained for about three months. It gradually rose to 20 mm. of Hg., where it remained for the fourteen months longer that she was under observation.

On the other hand, in an equally successful operation, the tension may remain high for from three to seven days and finally become subnormal for a short period, after which it gradually climbs to normal. Cases that behave in this manner are particularly apt to be successful. Meller (17).

Frequently a cyclodialysis will be successful in maintaining normal tension for several months or even years, but eventually there will be a gradual increase in tension that threatens the life of the eye. Such cases are particularly apt to yield to a second or even a third operation and remain normal ever after.

In November, 1909, a 42 year old man came with a glaucoma simplex in the left eye. The disc was incompletely cupped, the vision was 40/70, correctable to 40/50 and the tension was plus one. Treatment with miotics was pursued for nearly three months, but the tension remained around 37 mm. of Hg. In January, 1910, a cyclodialysis was performed. The tension remained normal until the end of March, and then rose to 34 mm. of Hg., from which height it could not be reduced. In May, 1910, a second cyclodialysis was performed and the tension again sank to normal and remained there until July, 1912. Then it rose to 37 mm. of Hg. and again could not be controlled. In September, 1912, a third cyclodialysis

was performed. Following this the tension sank to normal and has remained there to date, being measured every four months. In July, 1919, the tension was 22 mm. of Hg. and the corrected vision was 0.9.

But in the cases where the intraocular tension falls to normal or subnormal immediately subsequent to a cyclodialysis, and then becomes pathologically high within a week to a month, there is no object in repeating the operation, for a second or a third cyclodialysis will be no more successful than the first, and another type of operation must be resorted to.

One final word regarding the prognostic value of intraocular tension, both before and after operation. P. Knapp (33) showed that the tension of the normal eye is reduced on an average of 8.91 mm. of Hg. by three minutes of deep massage, altho this reduction is temporary and disappears within about twenty minutes. This procedure is of inestimable value in glaucoma, for it permits of a knowledge of the condition of the drainage of the aqueous. A failure to reduce intraocular tension by two or three minutes massage by more than 4 mm. of Hg. is indicative of blocked outlets and must be taken into consideration in forming the prognosis.

CONCLUSIONS: 1. Cyclodialysis is an operation that decreases increased intraocular tension, by freeing the angle of the anterior chamber of adhesions.

2. The particular indications for the use of cyclodialysis lie in the essential chronicity and freedom from inflammatory reaction of the disease.

3. Cyclodialysis is distinctly contraindicated in acute glaucoma, in glaucoma of an exudative or inflammatory type, and in cases where immediate operation is desirable.

4. The effects of a cyclodialysis must be judged by the behavior of the central vision, the visual fields, and the intraocular tension.

5. In about 50 per cent of the cases with proper indications, cyclodialysis is successful; in about 20 per cent of such cases, it produces temporary results that usually become permanent by a second or even a third operation; in about 30 per cent it is a failure.

BIBLIOGRAPHY.

1. Heine: Heidelberger Berichte. 1905.
2. Heine: Deutsche medizinische Wochenschrift. 1905, p. 824.
3. Heine: Muenchener medizinische Wochenschrift. 1906, p. 78.
4. Denman: Homeopathic Eye, Ear, and Throat Journal. 1909, p. 155.
5. Heine: Wiener medizinische Wochenschrift. 1906, March 3.
6. Krauss: Zeitschrift für Augenheilkunde. April, 1907.
7. Judin: Klinische Monatsblaetter für Augenheilkunde. January, 1908.
8. Judin: Westnik Oftalmologie. March, 1908.
9. Wichodzeff: Klinische Monatsblaetter für Augenheilkunde. December, 1907.
10. Weekers: Klinische Monatsblaetter für Augenheilkunde. August, 1907.
11. Heine: Klinische Monatsblaetter für Augenheilkunde. 1913, p. 770.
12. Stock: Klinische Monatsblaetter für Augenheilkunde. Beilage, 1910.
13. Wernicke: Klinische Montsblaetter für Augenheilkunde. November, 1908.
14. Knapp: Transactions Ophthalmic Section. A. M. A., 1909.
15. Elschnig: Versammlung Deutscher Naturforscher und Aerzte. Salzburg, 1909.
16. Bolte: Beiträge zür Augenheilkunde. Vol. 68, p. 463.
17. Meller: Graefe's Archiv für Ophthalmologie. Vol. LXVII, 3.
18. Meissner and Sattler. Graefe's Archiv für Ophthalmologie. Vol. LXXI, 1.
19. Waldstein: Klinische Monatsblaetter für Augenheilkunde. May-June, 1911.
20. Morax and Fourriere. Annales d' Oculistique. Vol. 151, p. 321.
21. Fridenberg: Ophthalmic Record. December, 1908.
22. Pyle: American Journal of Surgery. December, 1909.
23. Heine: Deutsche medizinische Wochenschrift. 1909, p. 2009.
24. Zentmayer. American Jour. Ophth. 1913. p. 23.
25. Gradle: Annals of Ophthalmology. Vol. 23, 1913. p. 657.
26. Posey: Ophthalmology. Vol. XII, 1915.
27. Pyle: Ophthalmic Record. Vol. XIX, 1910.
28. Ohm: Zentralblatt für Augenheilkunde. 1909, p. 353.
29. Zentmayer: Ophthalmic Record. Vol. XIX, 1910.
30. Brown: Ophthalmic Record. Vol. XIX, 1910.
31. Small: California State Journal of Medicine. May, 1907.
32. Meller: Ophthalmic Surgery. p. 212.
33. Knapp: Klinische Montsblaetter für Augenheilkunde. June, 1912.

NOTES, CASES AND INSTRUMENTS

OCCLUSION OF CENTRAL ARTERY OF RETINA, RELIEVED BY PARACENTESIS OF CORNEA.

LEWIS WHITE CALLAN, M.D., F.A.C.S.,

NEW YORK CITY.

A patient consulted me in June, 1919, complaining of sudden loss of vision in one eye. He awoke about 6.30 a.m., and was quite certain his vision was good in both eyes. In a half hour he became very much alarmed by the discovery of complete blindness in the right eye.

I examined the patient at my office about three hours after the onset of blindness and found the eye blind, due to occlusion of the central artery of the retina. The pupil reacted very sluggishly to light, and was larger than the other pupil. The margin of the disc was hazy, and the arteries reduced in size. There was a general edema of the macular region with the cherry red spot at the fovea.

A paracentesis of the cornea was immediately performed, and a dressing applied to the eye. The following day the vision was 6/5 with correction, and the fundus and the field of vision were normal.

This patient had been examined by me for glasses on three previous occasions, during the past ten years. He never had any attacks of loss of vision previous to this one, which would suggest an embolus rather than spasm.

TONOMETERS, PRESENTATION OF A NEW ONE SIMPLE AND PRACTICAL.

EDWARD J. BROWN, M.D.

MINNEAPOLIS.

Four years ago, having lost the conceit that my fingers were trustworthy in determining intraocular tension, I became interested in tonometers. Having some good friends and neighbors who had tonometers, which they seldom used, I was able to borrow the standard instruments, Schiötz, Gradle and McLean. I also ordered a Souter, subject to approval. With the latter I was unable to observe the denting of the cornea and read the scale at the same time, or to lock the instrument without so much displacement of the indicator as to make the observation worthless.

The size of the foot-plate of the Schiötz and McLean instruments (10 mm.) made them difficult to apply to the cornea in a large number of cases; and the differences of corneal curvature, as well as the personal equation of surgeon and patient, introduced elements which made the results too often contradictory and unreliable. The Gradle had a smaller foot-plate (8 mm.), but like the Schiötz had a scale too distant from the foot-plate, and like the latter required weights and the use of a table for determining the tension in terms of mercurial pressure.

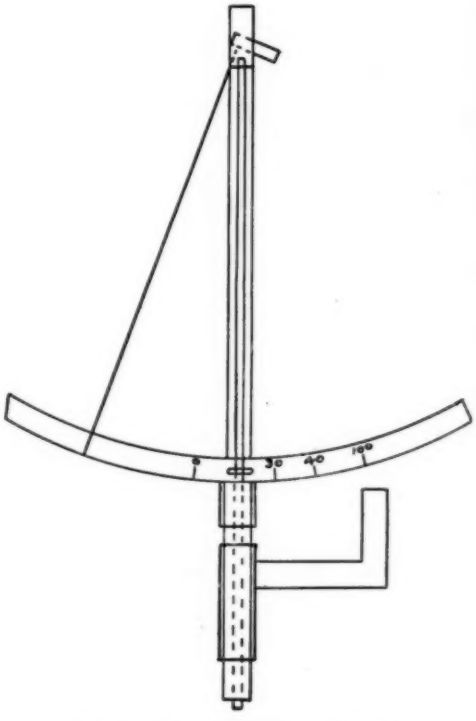


Fig. 1. A New Tonometer (Brown).

I ventured to make the suggestion to Mr. Meyrowitz, the maker of the Mc-

Lean, that he make a 6 mm. slightly convex foot-plate for the instrument of which I had the use. He courteously replied that he had sent my letter to the author of the instrument, who would write me. No other reply coming, I concluded to do some work of my own. I later learned by experiment that the suggestion of a convex foot-plate was not a good one for the reason that the contact of the plate with the cornea could be more readily noted by the slight reflex at the outer border.

At very small expense, but with a good deal of time and effort I constructed an instrument on the principle of measuring and determining in terms of mercurial pressure, the dent in the cornea made by a comparatively light plunger, while the 6 mm. slightly concave foot-plate descends to a contact with the cornea a distance of 2 mm. After using the instrument on a considerable number of patients and in comparison with the standard tonometers, I asked a skilled mechanic to make an instrument on the same lines, which is shown in the accompanying cut.

The scale was determined as follows: In one side of a large and substantial medicine dropper bulb a hole 10 mm. in diameter was cut and this was covered with two thicknesses of dental dam. The bulb was then slipped over the short end of a piece of heavy glass tubing bent at a right angle. The manometer was completed by adjusting a millimeter scale. Mercury being used at the different levels, 10, 20, 30, etc., up to 100 millimeters the instrument was easily tested and the scale determined. The instrument described seems to me more practical and more reliable than the other instruments in use, combining their good, without any of their bad qualities.

A SUGGESTION FOR A NEW PERIMETRIC CHART.

ALFRED COWAN, M. D.

PHILADELPHIA, PA.

All perimetric and campimetric charts give readings in degrees, which show the extent of the field of indirect vision along the direction of different meridians. This is very well for the field of vision, and might be considered all that is necessary. But it may also be interesting to know, for clinical purposes, at once and without the necessity of mathematical computation, the actual size of the blind spot itself; just how much of the retina is healthy; or the size of the lesion or lesions in pathologic conditions causing loss of vision in a circumscribed area. With the thought that this can be actually determined in a practical way, the following suggestion for a new perimetric chart is made.

The irregular outline of the normal field of indirect vision is due to the obstruction caused by the brow, nose and cheek, its greatest extent being over ninety degrees below and to the outer side where there is not this interference. Knowing this to be so, we may suppose that were it not for this obstruction, the normal field of peripheral vision would be exactly circular in outline and extend about ninety degrees in all directions.

Taking twenty-two millimeters as the approximate diameter of the interior of the globe and presupposing that the entire surface of the retina is sensitive to form, we would have, if it could be spread out, a flat circular area, the diameter of which would correspond or be equal to its previous circumference, which is 46.0768 millimeters. This result is obtained after allowing the anterior segment, back to and including the ora serrata, to be equal to one-third of the circumference of the eye and deducting the same.

The retina is now in the form of a flattened circular disc with a diameter of 46.0768 millimeters, receiving form impressions from a field of ninety degrees from its center outward in all directions, or one hundred and eighty degrees across the whole diameter. By this theory each degree in the field covers 1/180 of 46.0768 or about .25598 millimeters, approximately one-fourth of a millimeter.

To apply this for practical purposes and for convenience of reading, a perimetric chart is ruled with straight lines running both horizontally and vertically, spaced four degrees apart. These lines form squares over the entire field, each

side being four degrees in the field, which would be equal to four times .25598 or 1.02392 millimeters on the retina. The old lines being allowed to remain, we now have two distinct systems:

1. Circular and radiating.
2. Vertical and horizontal.

The chart as now modified, shows not only the visual field as before, (circular and radiating system), but also represents a plan of the retina itself, divided into spaces, each being equal to an area on it of close to 1.026256 millimeters square.

Thus the fields are taken as before and the chart marked in the usual way, the difference being in the reading after completion, which indicates millimeters on the retina as well as degrees in the field.

Of course, all these figures are in round numbers and the scale is certainly not mathematically correct, being based on anatomic rather than on optical principles. It is nearly enough accurate for practical purposes. The final result varies very slightly when the diameter of the globe is one millimeter more or less, or the plane in which the ora serrata lies is pushed forward or backward slightly.

It appears that a chart of this kind would be quite an improvement over the old. With its aid, we would be enabled to say at a glance and with a fa degree of accuracy, that the field is contracted so that only a certain portion extending over so and so many millimeters of the retina is functionating; or that the lesion causing a scotoma is such and such size. In presenting papers describing these conditions, it will not be necessary in many cases to accompany them with charts as heretofore, but the size and location on the retina may be given, making a better picture on the mind's eye than is possible by the old method.

It is obvious that the above scheme may be applied to the charts of any instrument for taking fields.

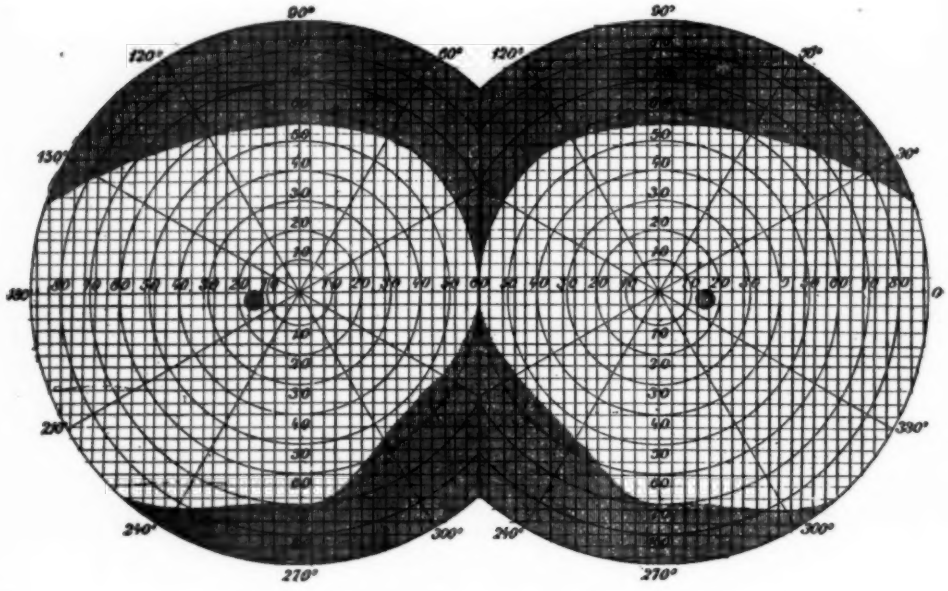


Fig. 1. Modified chart for recording fields. The series of vertical and horizontal straight lines are placed at a distance equivalent to one milimeter on the retina.

VISUAL DISTURBANCES FROM DAMAGE TO THE CENTERS.

CLARENCE A. VEASEY, M.D., F.A.C.S.,
SPOKANE, WASHINGTON.

Case 1. *Paralysis of accommodation from a blow on the occipital region.* D. W. D., a physician, aged forty-two, was first examined on January 30th, 1908. He stated that two days before he had a fall on the ice, striking the back of his head on the occipital region. He was dazed, but not unconscious. He thought also that there was a light blow on the forehead, but he was positive that he did not hit his nose, altho he bled slightly from the right naris. Eighteen hours after the fall he first noticed that his vision for reading with the right eye was greatly blurred, and it was for this reason that he presented himself for examination.

The vision of the right eye equaled 6/12+. The pupil was widely dilated and immobile, and there was complete paralysis of accommodation. The vision of the left eye equaled 6/5.

The patient was referred to Dr. F. X. Dercum of Philadelphia for a neurologic examination, but nothing abnormal was found other than the ocular condition referred to above. A skiagraph of the head was negative.

He was given iodid of sodium and subsequently strychnia, and on April 27th, 1908, nearly three months from the time of the accident and the appearance of the paralysis of accommodation, the latter had entirely returned.

The patient stated that he had not noticed that the accommodation had commenced to return until three weeks prior to its entire restoration.

Whether this patient had some disturbance in the center for accommodation or whether there was some piripheral disturbance in the nerve, it is impossible to say, altho from the nature of the blow and the subsequent behavior of the case the paralysis was probably due to a central lesion.

Case II. *Physic blindness with right lateral hemianopsia.* Complete recovery. D. C., female, aged sixty-one years, an unmarried school superintendent, was first examined March 16th, 1906, in consultation with Dr. Charles W. Burr, Philadelphia. The patient had had rheumatoid arthritis and valvular heart disease for a long time. Twenty-four hours before her eye examination was made the patient stated that she suddenly became blind in both eyes. According to the hospital interne who made the early tests, she was unable either to detect or to name light perception. When examined by me on the day following the appearance of the so-called blindness, both pupils were found to be 3½ mm. in size, facing a moderate light, but neither reacted to light, and both reacted in accommodation and convergence. The movements of the eyeballs were normal in all directions, and the ophthalmoscope showed no fundus changes. There was present right homonymous hemianopsia, the line between the blind and the preserved field passing down the median line, the fixation point remaining in the preserved half. The patient could distinctly see all objects in the preserved visual fields, as was shown by various tests, but was unable to name any object from vision alone, but could do so just as soon as the object was touched.

Twenty-four hours later the visual sense was found to be returning, as the patient could recognize many objects from sight as well as from touch, but the pupillary reaction to light was still absent. Three days later the visual acuity and the visual fields were entirely restored; the pupils reacted somewhat sluggishly to candle light and rapidly to daylight.

This case is reported as simply showing the curious effect of physic blindness in which objects are seen but not recognized until touched, and in which recovery may or may not be complete. In all probability, the condition was due to some disturbance in the occipital lobe which cleared up rapidly.

STANDARDIZATION OF OPHTHALMOLOGY AND THE ETHICAL ATTITUDE OF ITS MEMBERS.

JOHN H. BURLESON, M. D.
SAN ANTONIO, TEXAS.

During the last session of the Texas Legislature I was called to Austin to assist our Legislative Committee in defending our Medical Practice Act. The optometrists had introduced a bill which would in effect have emasculated one of the best practice acts on the statutes of any state.

The Attorney General of Texas, B. F. Looney, in an opinion given Feb. 21, 1913, said "it is our opinion that if the optometrists propose to treat defective or diseased eyes by the fitting of glasses, it would be practising medicine within the meaning of the Medical Practice Act of Texas."

I found on reaching Austin a committee of busy representative doctors, from all parts of the state, fighting to save our law and, to my great surprise, not an oculist among them.

From expressions heard in committee with these gentlemen and disgraceful charges made by opticians, before the legislative committee, which were apparently backed up by checks, and statements showing a part of the medical profession engaged in the work of ophthalmology to have relations and connections with opticians not in accordance with the principles of medical ethics, I have been prompted to present this subject for the consideration of our section.

Doubtless there are details of business management between the oculist and optician which must necessarily be adjusted but this section should come to a very clear understanding regarding their relations from a financial standpoint and the ethical attitude to be assumed by its members, otherwise county societies are likely to prefer charges and a very unfortunate situation arise.

The fight in the legislature with the optometrists has developed this fact:—It is charged by them that many specialists thruout the country are incompetent. The charge is apparently substantiated by numerous letters from ophthalmologists who say they have no incentive in fighting optometrists when the eye, nose, and throat specialty is so full of men absolutely incompetent for their work.

The National Association has already made a start toward definite standardization of our specialty, and basing the opinion on remarks heard during the legislative session, our State Association will have the matter up for solution unless we solve it ourselves.

The position taken by some of the better prepared men of this section, that they do not care to enter this fight on account of incompetency of some of our members is a reflection on organized medicine, and most certainly a reflection on ophthalmolgy. It is our fight! If we don't make it no one else will.

That the eye, ear, nose, and throat men of the country must establish a standard or suffer the consequences, there can be no doubt. What this standard shall be is for us to determine.

My personal opinion is that a standard should be based upon attainment and not on length of study. I have met men who boasted an internship in an eye hospital who were good neither as diagnosticians nor operators. While on the other hand I have known men who had less preparation, who were up to the mark in every respect and making good.

It seems to me the most vital point for us to decide now is not to try to correct abuses of the past but to prevent those of the future. I have no criticism of any man for the way he conducts his practice, but I do maintain that we as a profession have a right to adopt both a standard of ethics and proficiency to entitle a man to membership among us. This is necessary if we are to maintain our standing in organized medicine.

Some years ago, when I was chairman of this section of the State Medical Association I advocated, in my address, the formation of an ophthalmologic society and the establishment of a standard. In those good old days many men of our section would have their names on the program of other sections, write papers, and discuss subjects of particular interest to the general practitioner, and in-

cidently boost themselves along in a quiet way to the neglect and detriment of their own section. It was only after the general body discouraged the practice that it was stopped. I am not reflecting on the men who did this, as it was a common practice.

Our section is getting stronger and more scientific all the time. Most of our younger men are starting with more preparation and the general outlook is better; but it seems to me the time has come when there should be no place for the man who removes tonsils by the non-cutting method and straightens cross eyes without the knife, and who stoops to all the tricks of the trade to build practice. Such men are no better than the charlatan who puts his picture in the paper.

The time is opportune for this section to take action, appoint a committee to recommend a course to be pursued, both as to qualifications and conduct of these border line boys, be they large or small.

SOCIETY PROCEEDINGS

Reports for this department should be sent at the earliest date practicable to Dr. Harry S. Gradle, 22 E. Washington St., Chicago, Illinois. These reports should present briefly the important scientific papers and discussions.

ROYAL SOCIETY OF MEDICINE.

Section of Ophthalmology.

November 5th, 1919.

President, Mr. W. T. Holmes-Spicer.

Disseminated Choroido-Retinitis.

Dr. Rayner D. Batten showed a case of acute disseminated choroido-retinitis, of doubtful origin. The changes all took place practically while the patient was under observation. He was first seen by the exhibitor at the end of March last. Three weeks previous to returning home demobilised, he had lost central vision in the right eye. A nearly flat subretinal patch was found to the temporal side of the optic disc, below the superior branch of the retinal vessel. It was about one-third the size of the disc, and was triangular in shape. A small retinal vessel passed over it, and it was surrounded by an area of edema. The remainder of the right fundus and the whole of the left fundus were normal.

The eye was examined about once a week. Towards the end of May, the whole of the right fundus was thickly strewn with patches of choroiditis, and these could still be seen in much the same condition. The central patch had now subsided, and the vision had improved. As the appearance was strongly suggestive of syphilitic choroiditis, a Wassermann test was twice made, but was negative. There was no evidence of luetic disease about the man, and he strongly denied the possibility of such infection.

In December, 1916, when on military service, he had a wound on the foot, that was very tardy in healing. The area of the wound was still tender to pressure. A surgeon had declined to open up the foot again, on account of the stubborn healing on the former occasion. In August last the vision was: right 6/18, left 6/6.

When seen on October 2nd there was a history of sudden failure of vision in the left eye three weeks previously, with a central black spot. Later, a similar condition was found in the right eye, the vision in that eye being 6/9, the vision in the left having been reduced to 6/36. He asked opinions as to the likelihood of further attacks, and as to the probable causal agent.

Discussion. The President thought the involved area was raised above the general level of the fundus, and his view was that the cause was sepsis, from the original focus in the foot.

Optic Nerve Tumor or Injury.

Major J. F. Carruthers showed a patient, 21 years of age, who was not aware of anything wrong with his vision until he was 14. His attention

was drawn to his eye, however. by increasing dimness of sight. As his other eye was good, however, (vision = 6/6) he paid no attention to it. He later had dragging pain at the back of the eye, and last June he attended the Herbert Hospital for treatment. A consultation was held, and operative measures were discouraged.

The man returned to work, but came again in July, and then the eye was found to be quite blind, and the pupil did not react to either light or accommodation, only consensually with the other. The pain he, the speaker, did not attach much importance to, as it did not seem to deter from sleep or enjoyment. There had been no injection of the conjunctiva, and the media were clear. In July there was a pearly-white organised mass covering the whole anterior surface of the optic nerve: no hemorrhages nor even vessels were apparent in or on it. There appeared to be a retino-choroidal rupture, and the structures inside a pigmented ring were evidently being drawn towards the under surface of the tumor. There was very little sign of progress since July.

Discussion: Mr. Hugh Thompson, who saw the case in June, thought it was probably a birth injury to the nerve, a view in which several colleagues agreed. With the exception of a little more pigmentary disturbance, he saw no evidence of advance.

Mr. M. S. Mayou suggested the possibility of the tumor being tubercular, and asked whether the man had been investigated from that point of view.

Mr. Leslie Paton referred to a similar case, tho of less degree, which he showed before the Ophthalmological Society ten years ago. In that case there was no sign of rupture of the choroid. The discussion on it showed that most members considered it a congenital malformation in the connective tissue of the disc. The question whether or not this growth was progressing was an important one in considering whether the eye should be removed.

Colonel Parsons said Mr. Paton's case was one in which there was a little mass at the edge of the disc. There was no absolute proof that the lesion was a growth. The eye was excised. The section gave an appearance exactly similar to Coats' disease, exudative retinitis; it was in a very early stage. He thought it very likely that the present case was one of birth injury at the head of the nerve, with subsequent cicatrization.

Mr. Treacher Collins suggested that there had been some hemorrhage into the vitreous, and that the white mass in front of the disc was organised fibrous tissue.

Major Carruthers replied that no tubercular or other disease was found at the medical examination, and the urine was normal.

Avulsion of Optic Nerve.

Mr. H. R. Jeremy and Mr. McMullen showed cases of supposed avulsion of the optic nerve head. Mr. Malcolm Hepburn did not agree with the diagnosis. Mr. Simpson showed a case of probably a similar character.

Macular Changes.

Colonel Parsons exhibited a case showing bilateral changes in the macula. When the young man's mixed astigmatism was corrected, his vision was practically normal. He entered the Army unaware of any optical defect, and remained three years, until he was examined again before leaving for Egypt with a draft. Then Mr. Secker Walker, of Leeds, finding the macular changes, quite rightly secured his release. The changes were of long standing, and he thought it likely they were caused by colloid bodies in the choroid. These bodies were usually found in elderly people, but they were found in young subjects of retinitis pigmentosa.

Discussion: Mr. Treacher Collins thought the condition was probably retinitis circinata, i. e., hemorrhages into the retina itself, organising into white masses. The white patches round the disc seemed to be too extensive for ordinary colloid degeneration.

The President took the same view of the case as that expressed by Colonel

Parsons. In retinitis circinata there was, he believed, always some loss of vision, and generally the macula was very grey in appearance, what had been well described as a "passover bread appearance"—white masses with black holes in them.

Restoration of Socket.

MR. R. R. CRUISE showed a patient six months after a plastic and grafting operation on a damaged socket for the purpose of wearing an artificial eye. It showed either that the conjunctiva had encroached at the expense of the skin, or the graft itself had been so altered by the constant orbital moisture as to approximate to conjunctiva. He reemphasized the points he made when showing the case before the Ophthalmological Society six months ago.

The President expressed the congratulations of the Section to Mr. Cruise for his skill.

The Need of Ophthalmic Physicians.

DR. RAUNER D. BATTEN said the question discussed in his paper arose when a vacancy occurred on the staff of the hospital to which he is attached, and he urged that an ophthalmic physician rather than a surgeon was required. His arguments in favour of such an appointment were met by the reply that it was "not done" at other hospitals; and that, moreover, no men were available who had been educated for such a post. He was invited to bring forward the matter at the Royal Society of Medicine, and he now asked for an expression of opinion from members of the Section, not only as to the appointment of ophthalmic physicians for ophthalmic hospitals, but on the whole question of the education of ophthalmic men.

Cases requiring direct surgical treatment formed such a small part of the ophthalmologist's work, that he had to be responsible for a far larger clinic than he could personally attend to, if it was to yield sufficient operative material for the study and advance of the specialty. Hence large numbers of men were educated and given posts as clinical assistants, and given much responsibility; they became able ophthalmic observers, but were given no training in ophthalmic surgery, while their knowledge of medicine was insufficient to make them ophthalmic physicians.

The further advances in ophthalmology promised to be mainly on medical lines, therefore men with a physician's training and experience would be needed. New operations might continue to be evolved for glaucoma, the best form of cataract extraction could still be discussed; and some day there might be a successful operation for detachment of the retina or for conical cornea, tho he doubted whether success in these conditions was likely to come from the surgical side. On the medical side, however, there were endless possibilities, which the ophthalmologist tried to tackle with his detached scraps of medical knowledge.

The position of physicians attached to ophthalmic hospitals was that of consulting referees. They did not have patients of their own, for which they were answerable. Even in well-marked medical cases, the responsibility rested with the surgeon. In private practice, the responsibility was, more often, shared; and here, even if a case was referred to a physician, he was seldom in a position to study it from the ophthalmic point of view. At present the consulting physicians were not appointed for their knowledge of ophthalmology, but for their acquaintance with some branch of medicine, often the neurologic. The need was for ophthalmic physicians who would do their own work, who would have to live, so to speak, with their ophthalmic failures.

Among the instances in which the medical study would be valuable that he gave were:

1. Various vascular conditions associated with changing blood pressure, arteriosclerosis, vascular degeneration, thrombosis, and conditions associated with renal, hepatic and cardiac diseases.

2. Diseases of the central nervous system, not only the gross and obvious ones, but such obscure ones as unexplained optic atrophies, headaches, of

apparently visual origin, but without ocular defects.

3. The toxic and septic conditions causing ocular disease, such as iridocyclitis, concerning which knowledge was in an unsatisfactory state. Such cases were at present referred to the consulting physician, dentist, pathologist, etc., and after a negative report had been received from them all, the case returned for empirical treatment; whereas it ought to come back to the physician, who should "live with" it until he had found a cause. There was great need for improved training in research from the medical side.

Lastly, he mentioned various nutritional diseases, giving rise to corneal ulcers. Education as surgeons seemed to dull keenness and the power of investigating primary causes of certain ophthalmic problems. There was a hesitancy to stray beyond the orbit. In the case of cataract, in the ultimate issue, operation could be done to relieve the worst of the symptoms. Most of the systems of treatment depended on some local application to the eye, and were not based on investigation as to the cause. The fact that some cataracts would start rapidly and, after reaching a certain stage, become quiescent, pointed to some constitutional cause, one beyond the present power of recognition by surgeons.

He did not see how any thoughtful man could be satisfied with either the surgical diagnosis or treatment of many cases of glaucoma. There were a number which defied surgical treatment, and did not exhibit any of the anatomic causes, yet they progressed. Moreover some of the acute cases showed a virulence for which no anatomic explanation sufficed. He did not consider it was creditable to the ophthalmologist that, glaucoma having occurred in one eye, he was unable to prevent its onset in the other, except by operation. The attitude of the specialty towards detachment of the retina was even more hopeless.

The prime fault in this matter lay in the present system of educating the ophthalmologist, who was required to pass the highest examination in general surgery, a large part of which had no bearing on eyes. His time would be better spent in acquiring some knowledge of medicine and of his own specialty. At present, a man might work ten or fifteen years at a leading ophthalmic hospital without doing a major ophthalmic operation. His skill in this must be gained in the school of experience, which was expensive alike to surgeon and patient.

It was undesirable to attempt to teach operative work to all the young men passing thru the hospitals seeking ophthalmic training; it would be unjust to both patients and the hospital to attempt to do so. Ophthalmic surgery differed from all other surgery in that there was, in it, no gradual road to competence; one could not allow a man to begin an operation, such as that for cataract, and, if he got into difficulties, step in and set things right. The mischief was already done—and men had only two eyes.

The present position, he declared, was not fair to the public, nor to the honor of ophthalmic surgery; he would have ophthalmic operations in fewer hands than at present. This would mean not only a higher standard of operative skill, but enterprise and progress in surgical treatment. It would then be possible to have private ophthalmic hospitals, equipped for these special operations; this would be much preferable to having to depend on nursing homes, where eye operations were infrequent, and the nursing means not satisfactory.

In place of the Fellowship he would have an ophthalmic qualification, and it should be possible to qualify either medically or surgically; for the latter there must be evidence of operative skill. For the ordinary medical qualification, men were required to have attended 20 or 30 cases of midwifery: was it too much to ask that before a man was admitted as an ophthalmic surgeon he should show some operative skill in this department?

Physicians could be appointed to ophthalmic hospitals at once: they

should attend out-patients, and have beds at their disposal. They should see all classes of cases, but should be relieved of all operative work. Both physicians and surgeons would benefit greatly by constant close association, and the system he advocated would redound to the credit and advancement of ophthalmology.

The paper will be debated at the next meeting of the Section.

H. DICKINSON.

SOCIETY OF SWISS OPHTHALMOLOGISTS.

TWELFTH MEETING.

Basel, July 12, 13, 1919.

Abstract translation from the Correspondenzblatt für Schweizer Aerzte, v. 44, Oct. 30, 1919, by Dr. M. W. Fredrick.

Detachment of the Retina.

J. GONIN, of Lausanne, referred to his former studies on enucleated eyes, which led him to establish four causes of retinal detachment: traction, soulévement (pushing up), distension, and depression thru diminution of the size of the globe. Almost all the cases due to the last causes, and the great majority due to the second cause do not call for any special therapeusis, inasmuch as they are secondary phenomena of small importance, show little tendency to increase, and disappear with the primary causes (severe trauma, suppurating cyclitis, intraocular tumors, etc.)

This leaves the first cause, traction, to be considered. Here we have the cases which are called idiopathic, in which the retina seems to be the only part involved, but in which alterations in the uvea and vitreous have always preceded the retinal change. One should always bear in mind that:

1. The principal factor in retinal detachment is the traction exerted on the retina by the vitreous;

2. The liquid found behind the retina communicates with that of the vitreous by one or several tears in the retina;

3. A detachment beginning in the upper part of the retina tends to gravitate to the lower part, and when it is in the lowest part of the retina shows the least tendency to spread.

4. A reapplication of the retina is permanent only when the traction exerted on the retina by the vitreous has ceased, or is counterbalanced by a sufficient adherence of the retina to the choroid. Such a reapplication can be conceived of only after the closure of the tear or tears in the retina.

5. Treatment should be directed towards favoring the displacement of the detachment from the upper to the lower parts of the retina, reducing to a minimum the traction of the vitreous, facilitating the reapplication of the edges of the tears, and the development of an extensive chorio-retinal adhesion.

This proves the futility of those measures whose sole purpose is the evacuation of the retroretinal fluid or its absorption, (scleral puncture, aspiration or drainage of the fluid.) The only virtue in *Samelson's* treatment is the immobilization of the globe. The dorsal decubitus favors the downward displacement of the detached area. The utility of subconjunctival injections and of thermocautery is doubtful, unless they effect an adhesive choroiditis of sufficient intensity to enable the retina to overcome the traction of the vitreous after evacuation of the fluid. The treatment of Deutschmann, while theoretically logical, offers so many technical difficulties that it is almost impossible to carry it on to a successful result.

DISCUSSION: Siegrist, of Bern, called attention to the fact that the studies of Leber, and also of Gonin, had established that the idiopathic detachments of the retina, such as we most often meet in high myopia and after blunt trauma, are, in the majority of cases, the sequels of peripheral tears of the retina. These tears can be seen very often, if one takes the trouble to examine the periphery after dilating the pupil. As we know that they are often to be found in the upper temporal quadrant, seating the patient high will facilitate the search.

As to the genesis of these tears we have Gonin's theory of primary chorioretinitic foci in the periphery of the fundus, which lead to adhesions of the vitreous as well, the shrinking of which

produces the folding, and tears in the retina. Leber, however, thinks that in high myopia primarily, and in traumata secondarily to the tears produced by the injury, degenerative processes in the retinal periphery come about, leading to a proliferation of cells, which probably arise from the pigment epithelium, but also include vitreous cells. These cell masses constitute flat circumscribed bodies lying on the internal surface of the retina, and their shrinking produces the folding and tears of the retina, thru which the fluid enters behind the retina and pushes it in. The proliferating cell masses, according to Leber's newest views, may even produce buds, which detach themselves and wander toward the more central parts of the retina, where they produce the same results as the parent masses. This would dispose of the strands in the vitreous, something which, by the way, has never been seen with the ophthalmoscope, and would prove the uselessness of trying to divide these strands surgically.

The treatment of detachment of the retina, a condition in which but 5% of permanent cures have been effected (Vail's figures for 2,500 cases was 1/10%) is a thankless undertaking. Siegrist introduces the positive needle thru a large incision in the conjunctiva and pushes it thru the sclera into the subretinal fluid; 3 M A are passed for 2 to 3 minutes, and this is followed by scleral trephining. One of Siegrist's cases was permanently cured in this way; in a second case, in which the cure has lasted seven years, scleral puncture, repeated cauterisation of the sclera, dorsal decubitus and pressure bandage for four weeks and with three injections of 10% salt solution, were the means used. In a third case, now one year old, there was high myopia and extensive detachment, but a cure was effected with dorsal decubitus and pressure bandage, with twenty subconjunctival injections of 4% salt solution. In all Siegrist had twenty operative cases.

Experimental Cataract from Ultrared and Red Rays.

VOGT, Basel, supplementing his former studies which showed that the short ultrared waves of our artificial light sources reach the lens and retina in even greater amounts than the visible light, succeeded with the apparatus, which he describes very well, in producing a total cataract in the intact lens of an adult black rabbit by a three hour exposure. In a young rabbit the upper part only of the lens showed opacity, due, supposedly, to the cone of light impinging in this part principally.

The opacity is situated partly beneath the capsule, but mainly in the first zone of discontinuity, and affects the anterior and the posterior parts of the lens equally. The two areas of opacity are connected. Another pigmented rabbit showed opacity in the anterior upper part of the lens. In albinotic rabbits these effects could not be produced in the time mentioned above.

From his findings Vogt deduces that glassblowers' cataract is due to the ultrared and red rays; not, as was formerly assumed, to the ultraviolet rays. He hesitates to draw conclusions as to the etiology of senile cataract from his findings, and says that they do not explain the occurrence of cataract in India and other hot countries at an earlier age (if such be the case). Neither does he feel able to say that cataract may not be caused by other than ultrared rays, for instance by visible rays. A further effect of exposure to this ray mixture is the bleaching of the pigment of the pupillary edge; after a few weeks one could see the pigment scale off and fall into the anterior chamber. A regular accompaniment of the exposure is the paralysis of the sphincter of the iris, and the whitening of the hairs of the brow.

Parenteric Injections of Milk In Eye Diseases.

F. STOCKER, Lucerne, gave some of his results in treating various eye diseases with injections of milk. Three to twelve grams of cow's milk which had been cooked for four minutes and free of coagulum were injected thru the abdominal wall which was raised in a high fold between the pelvic rim and the costal border. The patient is then put to bed and kept in bed until the fever sub-

sides, which it does as a rule on the third day.

Musy pasteurizes the milk for 15 minutes and injects 5 c.cm. deep into the gluteal muscles every second to fourth day until he gets results, which means two or three injections. Fever as high as and above 39°. Pains in the head and the site of the injection, are the rule, but these are more than offset by the relief afforded the eye. The pain, photophobia, injection and swelling disappear with such rapidity as to merit the word magic. In those patients in whom rheumatic pains were present, these also disappeared within forty-eight hours.

In iridocyclitic processes which seem to be making no progress, these injections are of great value. In iridic processes there is rapid abatement of the inflammatory symptoms, and the pupil dilates quickly, and the corneal defects show an early vascularisation. In luetic iritis, with marked exudation and the formation of synechiae, the injections seemed to assist the systematic treatment, in as much as the ciliary irritation became less, and the synechiae which had resisted mydriatics ruptured.

In chronic irido-chorio-cyclitis, blennorrhea neonatorum, and tuberculous iridocyclitis the injections were of no value, but they acted very promptly in iritis following contusion of the bulb. No increased diuresis was observed, and diarrhea was noted in one case only.

M. W. F.

PITTSBURGH OPHTHALMOLOGICAL SOCIETY.

November 3, 1919.

Paresis of Right Superior Rectus with Spasm of Left Inferior Oblique.

Dr. W. E. Carson reported the case of Mrs. F., age thirty-five, who sought advice because of an inflammation affecting the left eye and persistent headaches. There was some photophobia, and she was quite nervous with indications of impending neurasthenia. There had been a slight "cast" in the left eye since childhood, which had recently become more noticeable with a tendency to diplopia, at times. Had worn glasses from her 22nd to 26th year.

On examination it was noticed that the head was tilted toward the right shoulder and slightly rotated to the right, with chin up and to the left. Patient is unconscious of the fact, and only realizes that her head is in such position when she notices it in her pic-

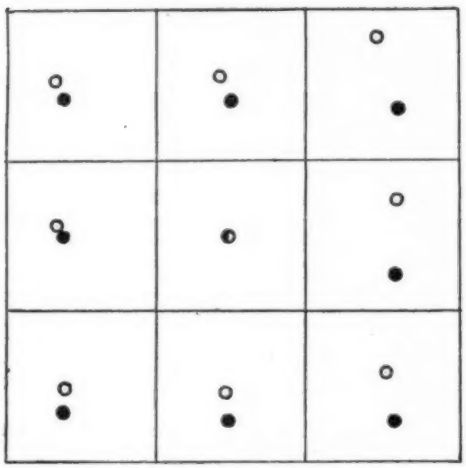


Fig. 1.

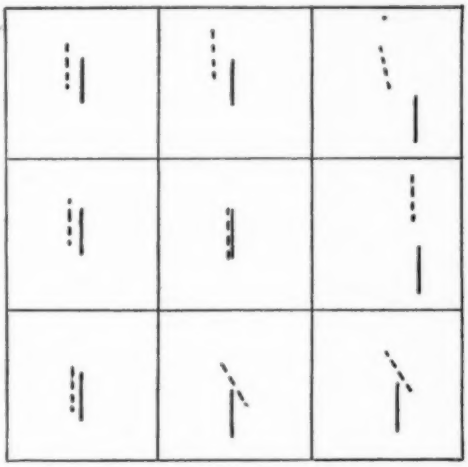


Fig. 2.

Diplopia from paresis of right superior rectus with spasm of left inferior oblique (Sarson's case). Fig. 1 shows displacement of the image, the false image shown by ring, true image by solid black circle. Fig. 2, inclination of images, false image belonging to right eye shown by broken line.

tures—friends have told her that the condition is becoming worse. There is marked conjunctival injection of the left eye. Smear for bacteria was negative.

The right is the fixing eye. On following an object up and to patient's right, the left eye turns up and in. In other portions of the field the coordination appears to be perfect. The phorometer with Maddox rod indicates left hyperphoria of twenty degrees and exophoria of four degrees. With a red glass over one eye and patient observing a luminous rod before the screen the maximum vertical separation was found to be in the right horizontal quadrant. A plus cyclophoria was also indicated.

A diagnosis of congenital paresis of the right superior rectus with over-action of the left inferior oblique, right eye fixing, was made. But it was thought best to see what degree of relief might follow correction of the axial ametropia and the following correction was made:

R. $+1.00\bigcirc$ Cy. $+0.50$ ax. 45°
L. $+0.75\bigcirc$ Cy. $+0.25$ ax. 140°

The patient reported in three weeks that she was more comfortable, but still having headaches particularly in region of left eye. Left hyperphoria of twenty degrees was again found.

The patient was referred to Dr. W. C. Posey who confirmed the diagnosis and did a tenotomy of the left inferior oblique. Dr. Posey wrote: "Immediately after the operation the patient experienced a relief in the tension which had been always present in the muscles of her neck, and already I find that she holds her head a great deal straighter." Her correction was revised to include a prism of three degrees base up over right eye, three base down over left eye. A week after the operation there was present left hyperphoria of nine and a half degrees (reduced from twenty), and the patient reported a marked sense of well being, saying she had never known what it was to feel so free. Is impressed with the fact that this sense of removal of restraint and rigidity extends thruout her entire body.

Six months later she reported that her eyes became tired after reading. A test of her refraction showed a change in the axis of the cylinder required by the left eye, from 140° to 160°. Left hyperphoria as before nine degrees. The cylindric correction was changed, with an addition of one degree to the strength of the vertical prism (making a total of 7°), with marked relief of symptoms. The patient has been comparatively comfortable since.

The operation was done thru an incision in the lower lid over the insertion.

Dr. Posey gives three indications for tenotomy of the inferior oblique one of which is as follows and would apply to the case here reported:

"Partial paralysis or even slight insufficiency of the superior rectus of the other eye when, owing to fixation being performed by the latter, the fellow develops a spasm of the inferior oblique so pronounced as to give rise to a disturbing (even if unnoticed) diplopia, a disfiguring upshoot of the affected eye, or a lasting torticollis. Such an indication is furnished especially by congenital cases."

Cataracta Nigra.

Dr. Edward Stieren showed a specimen removed from a myope of 15 D. who had been under observation for nineteen years.

Sept. 5, 1900, the first examination R.—16 D.S.$\bigcirc$—3.50 D. Cyl. 150° V. =2/32; L. 15 D.S. V.=6/32.

Numerous floating and fixed opacities and extensive staphyloma posticum, are present in each eye. The nucleus of each lens is well defined and with reflected lateral light seems darker in color than the cortex.

The nucleus of each lens has gradually grown larger and darker. Observations during the past few years have been made at about yearly intervals because of the patient's residence in California.

October 4, 1919, a combined extraction was performed on the left eye, vision being little more than light perception. A large section was made and

the lens delivered without loss of vitreous and practically in its entirety. There remains, however, in the anterior chamber considerable bunched up capsule, which will be needled shortly.

Black cataracts are really not black in color but are a dark mahogany brown. A number have been examined chemically and spectroscopically but never have any of the blood pigments been found, nor iron in any form.

It has been observed that dark cataracts developed much more slowly than light ones; and that a black cataract never becomes matured in the ordinary sense of the word, since it is not a cataract proper but a sclerosis of the entire lens which has become converted into a hard, dark-brown, translucent mass. Such lenses are always large and hard but can be operated upon with good results if a large section be made. They usually occur in myopes. The capsule is always much thickened, invariably requiring a secondary needling. Dr. Stieren had seen one other case, similar to this in every respect.

Hysteric Ptosis.

Dr. Edward A. Weisser reported a case of right ptosis (nonparalytica), in a man 25 years of age, the condition existing a little more than a year. With this ptosis there is a peculiar partial paralysis of the right superior rectus at times. Muscle balance taken with phorometer does not show any deviation from the normal, there being orthophoria in all directions, yet under cover the left eye turns slightly upward at times. The ptosis is not always present but at times the lid will twitch and then fall and remain down for varying periods. There is no pathology in either eye in any form. No history of trauma or syphilis. At various times Wassermanns have been taken and they were always negative. His refraction under cycloplegic is only +.50 sp. A diagnosis of hysteric ptosis was made and confirmed by Dr. Diller who saw the case later.

A Typical Gonorrheal Ophthalmia.

Dr. V. E. Vankirk reported that Mrs. P., when first seen Oct. 20, 1919, had a violent mucopurulent conjunctivitis with cloudiness of the cornea. The eye became inflamed two days before, but otherwise the history was negative. She was sent to St. Joseph's Hospital and bacteriologic examination made by Dr. Rockman.

He reported Gram-positive, extracellular diplococci found on several slides. The eye was flushed with cold 1-3000 cyanid of mercury, cold compresses of Oschner's solution employed for 10 minutes, and atropin sulph. 1% instilled, every three hours. Under this treatment the secretion became less abundant but the corneal involvement more marked.

On Oct. 26, 1919, a typical Gram-negative, intracellular diplococcus found, and the husband reported a urethritis. At no time has this case shown the usual velvety red conjunctiva or the typical creamy pus. Nor have the usual red edematous lids been noted.

Phlyctenular Ophthalmia.

Dr. E. E. Wible reported the case of Miss C., age 12 years. Admitted to hospital Sept. 21, 1919, suffering from extreme photophobia, was led in as if blind. Also complained of slight pain in R. lower abdomen.

Patient stated had "Flu" in October 1918, followed, one week after recovery, by red and painful eyes. This condition has been continuous since then. Has been under the care of two oculists. L. eye has been bandaged during the last five months, patient being told the eye was blind. Was on crutches for three months last spring on account of arthritis of the lower extremities. Family history negative; tonsils slightly enlarged, general condition good. On examination there were found phlyctenular ulcers, limbus, R.; and deeply infiltrated opacities of the lower half of cornea of L.; ocular and palpebral conjunctivitis, blepharospasm, extreme photophobia of both eyes and fissures of the outer canthi.

Treatment consisted of the usual remedies of atropin, yellow ointment and syr. ferri iodid. Bandages were removed from eyes, smoked glasses applied, patient gotten out of bed and with considerable difficulty was gotten

out into the hospital yard as rapidly as possible, with the result that in three weeks the patient was entirely well and with correction had vision of 15/15 in R. eye and 15/50 in L. eye. Following this her appendix was removed, which was found but slightly infiltrated at the tip. The internist also contemplated having a tonsillectomy done.

H. H. TURNER,
Reporter.

COLLEGE OF PHYSICIANS OF PHILADELPHIA, SECTION ON OPHTHALMOLOGY.

OCTOBER 16, 1919.

DR. WILLIAM T. SHOEMAKER, Chairman.

Unilateral Exophthalmos with Bilateral Ophthalmoplegia and Neuritis.

DR. WM. ZENTMAYER showed the following case: M. B., aged ten years. About three weeks ago there was sudden "swelling" of the right eye, with pain over the eye, lasting for one week. There was some vomiting and occasional diplopia during the first week. She has had measles, chicken-pox and whooping-cough. No convulsion or injury.

The right eye was proptosed 7 mm. and there remained only a very slight upward rotation of the eye. Pupil 4 mm. Left eye very slight upward, downward and inward movements. Pupil, 3.5 mm. Both eyes turned to the right. Face carried to the left and up.

R. E., 6/6 pt. L. E., 6/5. Illit.

R. E., upper-inner border of papilla prominent. Veins greatly dilated and tortuous. L. E., upper-nasal border of p. veiled. Sup. n. v. enlarged.

X-ray of sinuses and head negative. Wassermann and tuberculin test negative. Several conditions were considered: cavernous sinus thrombosis, posterior ethmoiditis, growth in the anterior portion of the brain pushing down the roof of the orbit and invading the oculomotor centers.

The absence of venous stasis, thrill and bruit was against, and the presence of unilateral exophthalmos with bilateral involvement of the muscles and optic nerve were for cavernous sinus thrombosis.

The apparent suddenness of the exophthalmos without previous symptoms of any kind, with a stationary condition, was against a neoplasm. The probable cause was cavernous thrombosis. An exploratory incision will be made to determine whether there is an orbital condition.

Dr. Rhein, who made the neurologic examination, believes the diagnosis rests between acute external ophthalmoplegia and cavernous sinus thrombosis.

Proliferative Chorioretinitis with Partial Avulsion of Optic Nerve.

DR. ZENTMAYER presented an adult male, who five years ago suffered a self-inflicted pistol shot wound of the head. The bullet entered the skull on the right side, just above the zygomatic arch, behind the external orbital rim and passing thru both orbits lodged in the anterior fossa of the brain, where it remains. The fundus of R. E. shows a mass of new-formed connective tissue overlying the position of the disc and extending upward several d. d. and forward into the vitreous 5 or 6 D. The lower and temporal borders are rounded and there is a broad band of similar tissue extending out toward the temporal region. There is considerable pigmentation of the borders and surface of the mass. Emerging from the edge of the mass and curving about its rounded border at several points there were vessels, some of which were new-formed, others the vessels of the retinal circulation.

On the left side there was a complete ptosis and paralysis of the external rectus. There were the sequelæ of iridocyclitis. V. = L. P. A Tansley-Hunt ptosis operation was done to relieve the patient of the adhesive strip he had been wearing to elevate the lid.

Different interpretations of the fundus picture might be given, but Dr. Zentmayer considered it to be a proliferative retinochoroiditis, with partial avulsion of the optic nerve. Similar

cases are reported and pictured in Lagrange's and also in v. Szily's atlas of *Fundus Lesions of War Injuries.*

DISCUSSION: Dr. Holloway stated that this patient had been seen by him several years ago in the dispensary of another institution. At that time the right eye was blind and presented the enormous areas of organized tissue that have just been described by Dr. Zentmayer. The position of the disc could be determined by the vessels curving toward it, altho the tissue covered them for some distance below the disc. When first seen the patient saw hand movements with the left eye. With the ophthalmoscope only a faint pinkish reflex could be obtained down and out and large floating masses could be seen which were regarded as a probable detachment of the retina. Much to his surprise, during the course of the next six months, this eye cleared up to such an extent that he acquired 1/15 vision and certain fundus structures could be vaguely seen. At the present time the vitreous has again become much involved and presents the appearance not unlike that which was noted at the time he was first seen.

Dr. Holloway stated that he had seen two other cases of similar gunshot wounds, in one case both eyes being destroyed.

Foreign Body in Sclera.

DR. WM. T. SHOEMAKER AND DR. HUNTER W. SCARLETT (by invitation) presented the case of a male steelworker from Ohio, who was struck near the inner angle of the left eye by pieces of case-hardened steel, September 19, 1919. The shop physician saw no evidence of a foreign body, and as the vision was good, he declared the eye uninjured. Patient resumed work but a few hours later complained of pain and blurred vision. The following morning the lids and conjunctivæ were edematous. After reexamination three pieces of steel were removed from the lower cul-de-sac by means of an applicator.

One week later the diagnosis of intraocular foreign body was made and the patient was sent to Canton for magnet extraction. The doctor in Canton localized a foreign body in the upper part of the eyeball, applied the magnet without result and told the patient that it was nonmagnetic. He was then discharged, with instructions to return to work and disregard the pain.

The patient then came to Philadelphia and consulted Dr. Scarlett, October 4. X-ray at the Lankenau Hospital showed a small foreign body embedded in the lower temporal portion of the sclera. External examination shows a pin-head sized perforation of the iris, 1 mm. from the pupillary border, about 9 o'clock, and a stringy horizontal opacity in the upper cortex of the lens. With the ophthalmoscope the F. B. can be seen as localized. There is a raised area of choroidal disturbance and a tiny detachment of the retina.

The vision of the eye is 20/50. The giant magnet was tried to its capacity. The traction caused a good deal of pain, but was not sufficient to liberate the F. B.

Here then was an eyeball with a piece of steel embedded in the sclera, which would not yield to magnetic persuasion. The damage done by transit of the foreign body was comparatively little and the eye is quiet and has a high degree of usefulness.

In Dr. Shoemaker's opinion further attempts at extraction are not indicated and the eye can safely be let alone. There was a time when he demanded the foreign body or the eye, but to take both in this case seems to be, at the present time, unjustifiable.

DISCUSSION: Dr. Holloway stated that the appearance of the fundus at the site of the foreign body reminded him very much of three cases he had seen a number of years ago. In making these remarks he had no intention of reflecting upon the accuracy of the x-ray examination that had been made of Dr. Shoemaker's case, but he merely wished to point out that he regarded accurate localization in such cases as necessary before ultraradical procedures were adopted. He then referred to one case in particular in which this same picture had been caused by choroidal pigment, which had been re-

garded as the foreign body until an accurate localization demonstrated that the piece of steel was immediately behind the sclera. He also pointed out that under such circumstances, where the wound of exit is in the macular region or near it, a stellate figure may be formed having the same appearance as a stellate figure seen in cases of nephritis and brain tumor.

Cyclodialysis for Glaucoma with Infected Conjunctiva.

DR. G. E. DE SCHWEINITZ, after a brief description of Heine's operation and the usual indications and results, referred to a case of subacute glaucoma in a man whose other eye was blind. The tension was very high, above 60 mm., the cornea steamy, and there was a persisting conjunctivitis which, on examination, yielded a pure culture of Staphylococcus pyogenes aureus. Miotics reduced the ocular tension but did not control it. A peripheral iridectomy, or corneoscleral trephining, or Lagrange's operation, seemed to invite disaster in the presence of such an active staphylococcus conjunctivitis. After as thoro cleansing of the conjunctival sac as was possible a cyclodialysis was performed, and immediately the small scleral incision cauterized with carbolic acid. The chamber deepened, there was no reaction of any consequence, miotics were continued, and at the time the patient was exhibited, nearly five months after operation, corrected vision was 6/9, the field had markedly widened, and the tension as measured with the Schiötz tonometer was 18 mm. Thus far it had not been found necessary to repeat this operation or to perform any other one. It would seem, therefore, that, even though it might prove of only temporary benefit, cyclodialysis followed by cauterization of the scleral incision was worth trying in conditions such as those described.

In a second case, in a Hebrew woman, the right eye was blind from staphyloma, the left eye in a state of advanced subacute glaucoma, with steamy cornea, obliterated anterior chamber and vision reduced to shadows. On both sides there was dacryocystitis; the canaliculi had been slit. Tension was very high; it was not possible to measure it accurately with the tonometer. After a course of miotics, which reduced somewhat the tension, a cyclodialysis was performed, exactly as in the preceding case. As soon as the spatula was withdrawn the anterior chamber was, altho shallow, reestablished. Within several days the tension was lowered, to about 30 mm. Subsequently it began to rise, the cyclodialysis was repeated, with the same good result, and since then, a few weeks only, it has remained normal and vision satisfactory. Treatment of the duct has checked all discharge, and cultures are free from pathogenic organisms. It is proposed now to try either a corneoscleral trephining or else a scleroiridectomy. Dr. de Schweinitz suggested that cyclodialysis in cases of practical obliteration of the anterior chamber and very high tension should prove to be a useful procedure preparatory to a more formal operation, in place of a posterior sclerotomy.

DISCUSSION: Dr. Zentmayer said when cyclodialysis was introduced he performed a series of operations on various types of glaucoma. On the whole the immediate results were good. As the operation seemed more adapted for the preservation of sightless glaucomatous eyes, and for secondary glaucoma with marked sclerosis of the vessels as in retinal hemorrhages and thrombosis of the central vein, the operation was later limited to such cases. It seems particularly well adapted to the second class. As has been pointed out again by Dr. de Schweinitz, the reduction of tension produced by the procedure is sometimes delayed for forty-eight hours, or, in other words, it comes on so slowly that often no noticeable reduction occurs within this time.

Dr. Holloway stated that over a year ago a patient had come to him with a glaucomatous eye, with vague light perception and practically complete obliteration of the anterior chamber. Doubting whether a cyclodialysis or a posterior sclerotomy would be of avail in securing any appreciable depth to the anterior chamber, he trephined the

sclera well back from the corneoscleral junction between the superior and external rectus and carried a narrow knife into the vitreous chamber. The tension was somewhat reduced for eight or nine days and there was a very slight deepening of the chamber, but the results were not permanent. He mentioned this case at this time, in the hope that others might try the same procedure in suitable cases.

Treatment of Hypopyon Keratitis.

DR. DE SCHWEINITZ reported the case of a workman, about fifty years of age, who came with advanced hypopyon keratitis of some weeks' standing, following a slight corneal injury. The hypopyon filled three-fourths of the anterior chamber, and above it there was a small abcess within the corneal layers. Cultures from the ulcer yielded a pure return of "diphtheroids"; no pneumococci or streptococci were present. The usual treatment, curettage, cauterization (trichloracetic acid), ethylhydrocuprein, dionin, iodoform dusting, etc., failed to check the disease. Fifteen hundred units of antidiphtheritic serum were injected. Within thirty hours an improvement was noted, further stimulated by additional serum injections. All the ocular pathologic conditions subsided (atropia was constantly used and frequent boric acid irrigations, but nothing else), and at present (some months after the treatment) the eye is quiet, the cornea, however, partly covered with leucoma.

Dr. de Schweinitz, referring to the notable favorable effect of the antidiphtheritic serum in this case, spoke of the recommendation which had been made by Darier, Fromaget, Zimmermann and other observers, of its use in infected corneal ulcers, and discussed some of the views which had been expressed in regard to the pathogenicity of xerosis bacilli in certain circumstances and of the relation of those bacilli to pseudodiphtheritic bacilli. He doubted if the ulcer in the case reported had been the result of the "diphtheroids," which probably should be regarded as secondary and without definite etiologic significance. He felt, however, in view of the results in this case, and in one of the recent cases which he briefly reported, and in view of other observations to which he had alluded, that trial of this serum in cases of infected corneal ulcer not yielding promptly to the usual measures, including autogenous vaccine therapy, should be made. He had not employed in this case thermotherapy, either by Weeker's method or with the thermophor of Shahan.

"Petit Mal" Benefited by Proper Glass Correction.

DR. P. N. K. SCHWENK related the case of M. T., aged thirty-four years, who was referred to him in September, 1918, with a history of having convulsions in infancy, while teething, followed by *petit mal* until her fifteenth year, when nocturnal convulsions began. She was then put on "bromides." For eighteen years (during the latter fifteen years of which she has worn glasses) she has had *petit mal* attacks and convulsive nocturnal seizures each month ten days before menstruation. For ten days after menstruation she is usually free. The attacks are preceded by an aura, a sensation in the spine between the scapulæ rising to the back of the head.

For six years she had frequent pains over the left eye and in the occipital region. No loss of bladder control. Her malady and the constant bromid medication made it impossible for her to concentrate her attention long enough at a time for her to study to any advantage, and so she left Bryn Mawr College without graduating.

So for eighteen years she has been depressed, gloomy and fatalistic, unable to carry on any line of work or realize her ambition. During these years she has taken bromides, in moderately large doses, twenty-six days out of each month. She came to Dr. Schwenk on September 2, 1918, wearing:

R.—2.75 s.⌒+5.25 cyl. axis 90°
L.—2.00 s.⌒+5.25 cyl. axis 80°.

Cornea and pupils normal; apparent parallel fixation; muscular movements normal; eye-grounds negative. Findings under a mydriatic (duboisin) were:

R. 20/c — 2.50 s.⊂+4.00 cyl. axis 100°=20/20 — 2.

L. 20/cc — 3.25 s.⊂+5.50 cyl. axis 80°=20/20 — 2.

She was ordered:

R.—2.75 s.⊂+.400 cyl. axis 100°.

L.—3.50 s.⊂+5.50 cyl. axis 80°.

She has worn this correction since September 6, 1918.

On December 13, 1918, Dr. Schwenk had the following report: The glasses relieved the left supraorbital and occipital headaches at once. She soon found the ordinary usual doses of bromides made her unusually sleepy, and began to reduce them with considerable trepidation. Her last major attack was September 6, 1918. She ceased taking bromides December 1. Has menstruated since and has had no attacks. She feels less depressed and can read or sew for several hours without trying her attention.

For eighteen years—although she had occasional provocations—she could not weep, as there were no tears. Recently she has been able to weep. The improvement is unquestionably due to the proper refraction, as she dates her betterment from the day she put on her new glasses.

Improved Method for Enucleation.

Dr. Frederick Krauss read a paper which will be published in full in this journal.

COLORADO OPHTHALMOLOGICAL SOCIETY.

October 18, 1919.

Dr. E. M. Marbourg presiding.

Penetrating Injury of Eyeball.

E. R. Neeper, Colorado Springs, presented a mechanician aged 25 years whose right eye had on September 11 been penetrated by a piece of steel, which passed thru the cornea and iris and which, after localization with the x-ray, had been removed with the giant magnet thru an incision below the internal rectus. There were bands, apparently of scar tissue, in the anterior vitreous. Should an effort be made to sever these bands, in order to avoid the risk of detachment of the retina? The vision was of large objects only.

Discussion: Melville Black, Denver. A single broad band might be cut, but in this case the bands do not seem to be definite enough.

C. E. Walker, Denver, was not disposed to recommend any further operative procedure on the eye; and several other members expressed themselves in favor of leaving the eye alone.

Recurrent Iritis? Tumor.

E. R. Neeper, Colorado Springs, presented a woman of 40 years, who in the course of the past year or so had had several attacks of iritis in the right eye. The last attack, in September 1919, had left permanent posterior synechia with an elongated pupil, thru which a white mass could be seen well forward in the anterior vitreous. The mass had been much smaller when first seen and at that time had shown as two smaller masses on the nasal side. At the time of demonstration the iris was crowded forward more than it had been nine days previously. The tension was normal. The patient had first noted a film coming over the sight of this eye during the late summer of 1918. Her father had died of cancer. Enucleation had been advised.

Discussion: Melville Black, Denver, while unable to form an opinion from the mere appearance of the eye at the present time, felt that Dr. Neeper's previous opportunities for study of the eye made it necessary to accept his judgment as to the necessity of enucleation.

W. H. Crisp, Denver, remarked that the eye was either normal or soft in tension, whereas in a tumor at such an advanced stage one would expect an increase of tension. He suggested that possible causes, especially in the line of focal infection, should be investigated before removing the eye.

Melville Black and D. H. Coover, Denver, said that a relatively low tension might frequently occur in the earlier stages of tumor.

D. H. Coover and W. C. Finnoff, Denver, suggested the possibility of tuberculous infection of the eye, and the diagnostic use of tuberculin; Dr. Finnoff adding that in the presence of suspected tuberculosis of the retinal vessels it was especially necessary to

use tuberculin with a great deal of caution, because of the danger of doing more harm than good.

Penetrating Injury with A Nail.

F. E. WALLACE, Pueblo, presented a man who had been struck in the right eye by a six-penny nail, which had penetrated the sclera 4 or 5 mm. to the temporal side of the iris; making a linear wound about 4 mm. in length, which extended from the iris backward. There was some loss of vitreous, and the accident was followed by a violent reaction. The vision had fallen by the end of the fourth day to 20/200, but at this time had increased again to 20/80. There were large floaters in the anterior vitreous immediately behind the lens. Should the eye be enucleated? The treatment had included atropin, heat, dionin and the internal use of sodium salicylat.

DISCUSSION: Melville Black, Denver. The floaters are merely the remnants of old hemorrhages, and the eye is doing pretty well. The period of greatest danger is past. If the patient is willing to take some chance, I should try to save the eye. There is a good chance of its becoming a fairly useful eye.

Retinitis Pigmentosa.

E. M. MARBOURG, Colorado Springs, presented a typical case of retinitis pigmentosa, with night blindness and contracted fields, in a patient who was deaf and dumb.

WM. H. CRISP,
Secretary.

ABSTRACTS.

Charlin, C. Orbito-Cranial Syphilis
Ann. d'Ocul., 1919, v. 156, p. 185.

The author divides the orbital lesions into two classes, those in the anterior portion, easily diagnosed and treated, and those lying deep in the orbit, hard to diagnose and of unfavorable prognosis His paper deals with the latter form. The lesions are usually tertiary, involving the orbital walls and frequently invading the neighboring sinuses and brain. The symptoms vary according to the location and neighboring structures involved. They are (a) visual, amblyopia or amaurosis; (b) pupillary, diminution or loss of reflex to light or accommodation; (c) ophthalmoscopic, papillary venous congestion, papillary edema, optic neuritis, and in the last stages, papillary atrophy; (d) motor, paresis or paralysis of ocular muscles and upper lid; (e) sensory, ocular, orbital and periorbital neuralgia, anesthesia, hyperesthesia; (f) orbital vascular, conjunctival hyperemia, conjunctival chemosis, edema of the lid, and epiphora due to lacrimal hypersecretion; (g) trophic, keratitis neuroparalytica, cutaneous lesions of the lid and neighboring regions; (h) proptoptic, lateral and exophthalmic; (i) inflammatory, orbital phlegmon. Identical lesions may manifest themselves under different symptomatology. For example, in one case a gumma of the orbito-cranial region showed only a gradual loss of sight, in another it produced very violent orbital and periorbital neuralgia, followed in three weeks by visual disturbance, while in a third case the principal symptom was exophthalmos. The author reviews the anatomy of this region, and explains why lesions at certain points produce one set of symptoms, as a rule, and at another a different set. Development of gumma within the orbital cavity causes increase in its contents and is followed by exophthalmos, whereas extraorbital gumma does not increase contents, so that there is no exophthalmos. Functional troubles are dependent upon the location of the inflammation. (a) In the region of the optic canal—the nerve is involved, resulting in decrease in vision with decrease or suppression of the pupillary reaction to light. The only ophthalmoscopic changes in the early stage is a retinal venous congestion; later the disc becomes white and atrophic. (b) In the region of the sphenoidal fissure—(1) multiple muscular paresis, (2) anesthesia, hyperesthesia and neuralgia; (3) palpebral edema, conjunctival chemosis, ocular venous congestion. The author describes ten cases with a comparative study of the clinical observations.

C. L.

American Journal of Ophthalmology

Series 3, Vol. 3, No. 1 January, 1920

PUBLISHED MONTHLY BY THE OPHTHALMIC PUBLISHING COMPANY

EDITORIAL STAFF

ADOLF ALT,
Metropolitan Bldg., St. Louis, Mo.

M. URIBE-TRONCOSO,
143 W. 92nd St., New York City.

MEYER WIENER,
Carleton Bldg., St. Louis, Mo.

CASEY A. WOOD,
7 W. Madison St., Chicago, Ill.

HARRY V. WÜRDEMANN,
Cobb Bldg., Seattle, Washington.

EDWARD JACKSON, Editor,
318 Majestic Bldg., Denver, Colo.

CLARENCE LOEB, Associate Editor,
25 E. Washington St., Chicago, Ill.

Original papers and books for review may be sent to any member of the editorial staff. Reports of society proceedings, correspondence, and other scientific communications should be addressed to the Editor.

Proof should be corrected and returned within forty-eight hours to the printer. Reprints may be obtained from the printers, Tucker-Kenworthy Co., 501 S. La Salle St., Chicago, Ill., if ordered at the time proofs are returned.

Subscriptions, applications for single copies, communications with reference to advertising or other business, should be addressed to

H. A. FOX, Manager, 7 West Madison St., Chicago, Ill.

VOLUME THREE.

Those in charge of the AMERICAN JOURNAL OF OPHTHALMOLOGY take up the work of its third year holding steadily to the purpose to make it the most widely useful ophthalmic journal it is possible to publish. To the special student it will be indispensable on account of its bibliographies and indexes and its digest of the world's literature, as well as the fact that it contains the most important articles on certain subjects. For the isolated practitioner of ophthalmology it will keep and extend the broad scope and organization, the readiness to publish the things he wants to read, that make it the one journal for those who take but one relating to this branch of medicine.

The YEAR BOOK portion will this year be published as a separate supplement quarterly. It will preserve much the same form as heretofore and will be somewhat more full and complete. The new arrangement makes easier the expansion of both journal and supplement; which is inevitable, altho it will be gradual, and must be accompanied more and more by careful sifting of the matter admitted to our pages. Growth in size must be paralleled by improvement in the literary form and the scientific value of contents.

The development of our department of SOCIETY PROCEEDINGS is being taken up as one of the most important parts of our work; and it will be pushed by one of our active collaborators recently released from war service. More and more, society meetings come to be the channel for the expression of the newest thought, the presentation of the most recent discoveries, and the reports of their transactions a most important part of the literature. We shall push this feature of the journal, both because it gives so much of value to our readers for the pages devoted to it; and because in encouraging the growth, regular meeting, and scientific work of ophthalmologic societies we are serving most efficiently the interests of the great mass of ophthalmologists.

In the list of our collaborators new names will appear from time to time thruout the year, and in our pages the evidence of their activity. This

growth will be most apparent in the more distant countries, for wherever the English language is read the AMERICAN JOURNAL OF OPHTHALMOLOGY is taking its place among the standard scientific journals of the world.

E. J.

WASTE OF ENERGY IN OPHTHALMOLOGY.

Every year when abstracting and digesting ophthalmologic literature for the chapters of the Ophthalmic Year Book, the reviewers cannot fail to be impressed with the very considerable waste of energy and time incurred by many authors, who claim to have devised "new" ideas, new methods or new operations, by their entire lack of information of what other men have done before on the same, or allied subjects.

Perhaps the lack of sufficient facilities, especially in the line of good ophthalmologic libraries in which to study and saturate themselves with the subject, on which writing is intended, is at the bottom of the trouble.

University towns in Europe, even small ones, have generally good libraries, with sets of nearly all special journals, monographs, large encyclopedias and ordinary text books. It would be in the interest of medical education and research, that new libraries should be formed in each State of the Union, and that the old ones be provided with good encyclopedias and also sets of special journals, published in this country and abroad.

Younger authors, when trying to write on one special subject generally go for information to well known text books, and consider "new" those matters which are not dealt with in those books. In doing this they forget that science in the process of formation finds its way to the medical public mainly thru the journals, and that to be thoroly acquainted with what others have done before, it is necessary to search the former for many years past. The use of large encyclopedias is a necessary first step, the subject being treated there in an exhaustive and complete manner with bibliographic references appended. In many cases even the reading of the papers or monographs quoted is imperative, when first hand or detailed information is needed.

For bringing the subject up-to-date, a thoro search in the indexes of many files of ophthalmologic journals, year after year, would be necessary, and after painstaking labor much indispensable information would be gathered, but that is certainly a very long and troublesome way.

Fortunately we have in the "Ophthalmic Year Book" means of obtaining this information easier, quicker and in a most complete manner; this publication covering the literature of the whole world.

The helpfulness of this new device for literary work is not generally recognized. As the reading of the Year Book is not easy, and perhaps at times tiresome, because of the concentration of new thought it requires, and the previous knowledge of the subject treated it assumes, the reader ordinarily makes hasty perusals, staying perhaps longer in some familiar subjects. But when after a systematic study of one subject from the larger works, one runs over the Year Book, not for the last year only, but thru many volumes back, the whole matter stands in a better light, and the progressive advance of science is being watched gradually and and recognized thoroly.

Still as we said before, it is always wise to go to the original sources, to the papers or monographs themselves when writing on new subjects. The reviews, and even the abstracts reflect the personality and training of the reviewer, and some times do not give due justice to the merits of the papers. It is for the prospective writers to draw from the original sources a better and clearer understanding of the thoughts of former authors.

It may indeed be assumed that the time has passed, when the experience of one man alone was conclusive in a given subject. But on the other hand,

progress in medicine is dependent not on the quantity of the materials set forth for building, but and especially, of the quality of them. Incomplete, hastily written articles, without references do more harm than good. In reviewing these papers for the digest, striking contrasts are noted between the writings published for the good of the science, and those for complying with medical obligations, or for purely self advertising purposes. Even in those written for the sake of science, unwarranted conclusions are sometimes drawn from poorly or hastily observed facts.

In the direction of "new operations" our literature seems to be a new "Penelope's tapestry," woven and unwoven incessantly. Cutting 3 or 4 mm. farther or placing a stitch in a reverse or "new" way, means the elaboration of a paper with lengthy descriptions and many cuts. There are articles in which a new operation is proposed and discussed, its advantages and drawbacks stated, the author ending by the confession that he has never performed the operation described; but offers his conclusions as mere suggestions for somebody else, with better opportunities to verify their accuracy.

The true motives of these and other papers are so frequently unnoticed, that general or even special journals accept them for publication; the result being an enormous overcrowding of medical literature and a large waste of energy and time.

To say something new and truly original in our branch, it is necessary to go ahead of our predecessors, to the very front in the race for advancement, before we can claim another step forward. Even those who separate themselves from the beaten track and make a new trail, must know where the old trail ends, in order to avoid a false claim, or going into a blind alley.

Teachers in ophthalmology, all over the country, can do much for the progress of our specialty, if they emphasize before their students the importance of ascertaining what others have done on a subject all over the world, before any attempt is made to set forth supposedly new ideas, new methods and especially new operations.

URIBE TRONCOSO.

HOLE IN THE MACULA.

The series of holes in the macula reported in the November number of this journal is much larger than any series previously reported, at any one time. The cases were all observed in young men, examined for military service and furnish a fair statistical basis for general conclusions. The clinical characteristics of such lesions are now established. The typical cases always involve the fovea centralis, being practically concentric with it; and the appearances of the lesion are well shown in the colored plate.

The size varies somewhat as is illustrated in this series of cases. This we may suppose depends partly on the extent of retina in this region that has the essential foveal structure—the absence of vessels, nerve fibres, most of the retinal layers, and supporting tissue generally. Probably it also depends on the severity of the injury or the disease process that causes the lesion; which would naturally determine the distance to which the atrophy would extend, in the gradually thickening and strengthening retina surrounding the fovea.

In young persons hole in the macula is due to trauma; generally a contusion as by a stone, marble, stick, baseball, flying cork, etc. Such injuries occurring in childhood, and causing no external damage to the eye, are apt not to be very closely investigated. For a time the exact character of the lesion is concealed by intraocular hemorrhage. The patient notices the sight improving a little later, and does not know when the improvement ceases. Finally he accepts unconsciously his loss of central vision; as it causes no impairment of his binocular field, and he has the other eye for accurate seeing at the fixation point. This accounts for the discovery of so many cases previously unsuspected, when

large numbers of recruits came to have each eye tested separately.

Ogilvie who gathered together 15 cases thought this retinal lesion always traumatic, and diagnostic of the kind of injury which produced it. But not all cases of hole in the macula are due to trauma. Coming on later in life. it is more commonly due to retinal disease. The first cases reported in this country, by de Schweinitz, were two of the "senile form." One of these was associated with arteriosclerosis, and such association had been noticed by Haab. Such a case may give great concern from the start, and the gradual loss of visual acuity is pretty certain to bring an adult patient under observation. Hole in the macula is also one of the unusual degenerative lesions that attend high myopia; and Cohen described one caused by rupture of a choroidal abscess.

As to its early course very little is known. Kuhnt had noted it in 1891, but did not describe it fully until 1900. Other descriptions of it appeared in the latter year. But all of these referred to the lesion when it had assumed its permanent form, and might have existed for years. One of de Schweinitz' patients had only noticed failure of central vision for three weeks. But she had suffered from iritis nine months before which left her with vision of 6/9; and the ophthalmoscope showed at the first examination nearly the typical appearance of such a lesion, which underwent very little change afterwards.

Zentmayer saw a traumatic case one week after the eye had been struck with a piece of wood. There was then blood in the anterior chamber and increased intraocular tension. After four weeks the typical hole in the macula had developed, with deep glaucomatous cupping of the disc. Kipp saw an eye the day after injury, and found the characteristic red oval spot in the macula. But the optic nerve had been torn across by the bullet that caused the injury, the retinal vessels were very narrow, and the whole retina was whitish. This eye was enucleated on the fourth day and studied by Alt. He found the edges of this somewhat ragged hole bent forward toward the vitreous, the cells there staining badly, and pigment epithelium beginning to proliferate and invade the retina. Early studies of the lesions that end in hole in the macula would have especial value.

E. J.

AMERICAN BOARD FOR OPHTHALMIC EXAMINATIONS.

With the ending of world war, and the return of hundreds of American ophthalmologists to civil life, there is a renewed interest in the work of this agency for standardizing and improving the training for ophthalmic practice. And this new interest is being met by a new activity on the part of the Board.

When over half its members were in the service of the United States Government, its activity as a board was necessarily somewhat in abeyance; but it is very much alive and will be a good deal in evidence in the next few months.

Elsewhere we publish the list of those who have been awarded its certificate up to the present time. It is a very creditable list in spite of the difficulties and delays of organization, energies diverted to other channels and the hesitation of older men to give countenance to a new institution. In the next year we expect to see this list doubled from among the more active, well-trained, members of the ophthalmic branch of the medical profession; who desire, both to support a movement that promises so much for the future of American Ophthalmology, and to try out their own training and scientific development and equipment with the idea that these should be pushed and kept up to the best standard attainable.

The organization and personnel of the Board is now as follows:

Representing the American Ophthalmological Society:

Dr. Myles Standish, Chairman.

Dr. John E. Weeks.

Dr. William C. Posey.

Representing the Ophthalmological Section of the American Medical Association:

Dr. Edward Jackson.

Dr. Hiram Woods.

Dr. Walter R. Parker.

Representing the Academy of Ophthalmology and Oto-Laryngology:

Dr. Walter B. Lancaster.

Dr. John R. Newcomb.

Dr. Wm. H. Wilder, Secretary.

The next meeting of the Board will be held at New Orleans, just before the meeting of the American Medical Association the latter part of April. It has been found that there is a tendency to delay making application until a few days before the time set for the meeting of the Board. This necessarily postpones action upon such application until the next meeting; always an interval of several months, for a board the members of which have to come from all parts of the country. A rule of the Board has required the submission of case reports at least sixty days before the meeting at which the application was to be acted upon. This rule has sometimes been relaxed, when during the war the number of applications was small; but the interval is none too long when several hundred case reports are to be sent from one member of that committee to another, and read and passed upon. If intending to join in this wide movement to improve the training for ophthalmic practice, the injunction, "Do it now," is most appropriate.

E. J.

CORRESPONDENCE.

Examining Recruits.

To the Editor: In his very interesting paper on "Macular Hole" (November issue) Dr. Middleton casts a rather unwarranted aspersion on the work of the ophthalmic members of the examining boards. He is manifestly not familiar with the handicaps under which the work had to be done, viz.: An average of 150 men called at 1 p.m., three days in the week; rendezvous at some public building; and the examinations all made in such rooms therein as could be made to serve. If only 100 men appeared, and 3 minutes were allowed for each it meant 5 hours of nerve racking work. Under such conditions, the best that could be done was the weeding out of the plainly defective, and the passing of the doubtful cases up to the regular army board. I may add, as measurably balancing the account, that I have seen some returned soldiers that I would have rejected in the "3 minutes."

H. B. Young.

Localization of Foreign Bodies.

To the Editor: In the May 1919 number of the American Journal of Ophthalmology I found an article by John J. O'Brien, M. D., entitled "Foreign Bodies in the Eye Ball, Three Illustrative Cases." In case two he removed an eye after having been informed by two reliable roentgenologists that there was a piece of steel inside the globe and discovered afterwards that the steel was in the orbit outside the eye. He presents a plan which he believes would be helpful in avoiding a like tragedy in future cases. It is as follows:

"The Roentgenologist of the Manhattan Eye, Ear and Throat Hospital willingly told me how to avoid a like tragedy in the future. Suppose the exposure for the picture is ten seconds. For the first five, have the patient look straight out, then have him change the direction of the visual axis by rolling the eye up as much as possible and complete the exposure. Make another exposure but do not move the eye. If the foreign body is in the globe, the X-ray will show either two bodies or an extension in the direction of the movement of the opacity as compared with the latter picture. When the foreign body is in the orbit or adjacent tissues its position is not affected by any movement the eye will make. There is, however, a slight possibility of error when the foreign body is in an external ocular muscle or tendon. Then it will show some displacement but a careful reading of the picture will discover the true meaning."

The above stated plan will undoubtedly be of very great use in a great many of the cases in which there is doubt as to whether the foreign body is inside or outside the eye. However, I do not believe that this plan will definitely locate the foreign body in all the doubtful cases. There is not only a slight possibility but a very great possibility of error in the plan which he presented. This is illustrated I believe in a case in which I unfortunately removed an eye unnecessarily, and I wish to report this case because I do not believe that the above method of localization or any other method would have definitely located the foreign body either inside or outside the eye. Altho we did not try this method there is no question in my mind that the body would have moved with the eye ball.

It was a pity that the eye had to be sacrificed when the metal was outside the globe and certainly would not have caused very much trouble. One, of course, regrets that any thing of this sort should happen. However, we can not always be sure that the foreign body is inside or outside the ball and prior to the enucleation my decision to remove the globe appeared to me the proper and wise step.

One authority has stated that "the most common and dangerous failure of roentgen-ray localization of foreign bodies in the eye has been the report that the foreign body was outside the eye ball when it was really within it!" I might change this statement by saying "that it is certainly a sad failure of roentgen-ray localization to find a foreign body inside the eye when in fact it is outside the eye." However, I do not attach any blame to the roentgenologist, who made the localization in the following case and who is a very skilled and reputable man, but to the fact that there was no plan that could have been used to make a true decision as to its location.

The case is as follows: A man 45 years of age, machinist, family and personal history negative, was pounding a tool with a hammer, both of which were made of hard tool steel, when, a small piece of metal broke loose from one of the tools, striking the left eye. I saw the case ten hours after the injury and found a vertical wound in the cornea 3 m.m. in length just inside the limbus at eight o'clock. The wound was a clean cut incision such as might have been made with an ordinary von Graefe cataract knife. It was easy to trace the steel through the cornea and the iris at the time of examination, but I was unable to make out any of the details of the fundus on account of the haziness of the lens. The wound in the iris was also clean cut and did not gap. There was no hemorrhage to be seen in the anterior chamber and no proptosis of the eye ball. The roentgenologist made a thoro examination and decided that the foreign body was in the eye ball about 6 m.m. to the nasal side of the optic disc and just in front of the retina. The wound in the cornea was healed in two or three days, no apparent inflammation of the iris, and with an opaque lens.

Acting upon the report of the roentgenologist I made an attempt to remove the foreign body through a posterior scleral incision with a magnet but failed to recover the steel. I used a small hand magnet which was very powerful and with a long tip which I was able to introduce into the incision. Deciding it was dangerous not to remove the eye after the trauma of the injury and operation, and because the steel was, as I thought in the globe, I accordingly enucleated it. However, I discovered the steel just outside the eye lying flat against the sclera about 6 mm. to the nasal side of the optic nerve. It was a piece of hard tool steel about one half m.m. in thickness, 3 mm. in length and 2 mm. in width. It was bright and untarnished as a new knife blade and the edges were very nearly as sharp. The general direction of the steel had been on a line thru the puncture and counterpuncture toward the ostium of the sphenoid sinus. After making the counterpuncture the piece of steel had turned almost at right angles, hugging the sclera and

traveled to the spot where I found it. The counterpuncture was a clean incised wound through the three coats. This wound had started to repair at the time the ball was enucleated and it took quite a little force to reopen it.

CHARLES J. ADAMS.

Kokomo, Ind.

CERTIFICATES IN OPHTHALMOLOGY

Up to the close of the year 1919 the American Board for Ophthalmic Examinations has conferred its certificate upon the following applicants:

Adams, Charles F.....Trenton, N. J.
Allport, Frank.....Chicago, Ill.
Andrews, Joseph A.....Santa Barbara Cal.
Barnes, J. Steele.....Milwaukee, Wis.
Beach, Sylvester J.....Augusta, Maine
Bedell, Arthur J.....Albany, New York
Bell, Mace Hudson.....Vicksburg Miss.
Benedict, Wm. L.....Rochester, Minn.
Bennett, Arthur G.....Buffalo, New York
Black, Melville.....Denver, Colorado
Black, Nelson M.....Milwaukee, Wis.
Blair, William W.....Pittsburgh, Pa.
Blue, J. B.....Memphis, Tenn.
Briggs, H. H.....Asheville, N. C.
Brown, Samuel H.....Philadelphia, Pa.
Bruner, W. E.....Cleveland Ohio
Bulson, A. E., Jr.....Fort Wayne, Ind.
Butler, W. K.....Washington, D. C.
Buvinger Chas. W.....East Orange, N. J.
Cadwell, C. T.....Poughkeepsie, N. Y.
Calhoun, F. P.....Atlanta, Ga.
Carson, W. E.....Pittsburgh, Pa.
Cayce, Eldred B.....Nashville, Tenn.
Charles, Jos. W.....St. Louis, Mo.
Clark, C. F.....Columbus, Ohio
Clark, Fred. T.....Westfield, Mass.
Cohen, Martin.....New York City
Conlon, Frank A.....Lawrence, Mass.
Connole, Joseph V.....Philadelphia, Pa.
Crisp, William H. .....Denver, Colorado
Culver, Chas. M.....Albany, N. Y.
Dancy, A. B.....Jackson, Tenn.
Darling, Chas. G.....Chicago, Ill.
Dennis, D. N.....Erie, Pa.
Dennis, Edward P.....Erie, Pa.
Derby, George S.....Boston, Mass.
Donovan, John A.....Butte, Montana
Dorsey, J. G.....Wichita, Kansas
Duncan, Jos. L.....Pittsburgh, Pa.
Easton, E. T.....Boston, Mass.
Ellegood, J. A.....Wilmington, Del.
Emerson, Linn.....Orange, N. J.
Fagin, Robert.....Memphis, Tenn.
Feingold, M.....New Orleans, La.
Francis, L. M.....Buffalo, N. Y.
Fridenberg, P. H.....New York City
Fringer, W. R.....Rockford, Ill.
Gifford, Harold.....Omaha, Nebr.
Gill, George.....Elyria, O.
Glosser, H. H.....Buffalo, N. Y.
Gradle, Harry S.....Chicago, Ill.
Greenwood, Allen.....Boston, Mass.
Gurley, L. M.....Johnstown, Pa.
Hansell, H. F.....Philadelphia, Pa.
Harrower, David.....Worcester, Mass
Hartshorne, Isaac.....New York City
Henderson, F. L.....St. Louis, Mo.
Higgins, R. P.....Cortland, N. Y.
Holt, E. E., Jr.....Portland, Maine
Holt, E. E., Sr.....Portland, Maine
Howard, Harvey J.....Peking, China
Howe, Lucien.....Buffalo, N. Y.
Hurley, Edward D.....Boston, Mass.
Hussey, Edward J.....Holyoke, Mass.
James, John H.....Mankato, Minn.
Jervey, J. W.....Greenville, S. C
Jessaman, L. W.....Framingham, Mass.
Johnson, W. B.....Paterson, N. J.
Johnston, Wilson.....Portland, Ore.
Kennedy, E. W.....Rochester, N. Y.
Kirkendall, J. S.....Ithaca, N. Y.
Koller, Carl.....New York City
Kollock, Chas. W.....Charlestown, S. C.
Lamb, Robert S.....Washington, D. C.
Lane, Laura A.....Faribault, Minn.
Larkin, B. J.....Indianapolis, Ind.
Lester, John C.....New York City
Levy, Louis.....Memphis, Tenn.
Lewis, A. C.....Memphis, Tenn.
Lewis, F. Park.....Buffalo, N. Y.
Linn, Jay George.....Pittsburgh, Pa.
Lovell, David B.....Worcester, Mass.
Macleish, A. L.....Los Angeles, Cal.
Mansur, Leon W.....Los Angeles, Cal.
Marlow, F. W.....Syracuse, N. Y.
Martin, Henry H.....Savannah, Ga.
May, Charles H.....New York City
Means, Chas. S.....Columbus, Ohio
Minor, James L.....Memphis, Tenn.
Moore, G. A.....Palmer, Mass.
Moore, Thomas W.....Huntington, W. Va.
Nabers, Samuel F.....Birmingham, Ala.
Parker, Walter R.....Detroit, Mich.
Patterson, J. A.....Colo. Springs, Colo.
Patton, James M.....Omaha, Nebr.
Peter, Luther C.....Philadelphia, Pa.
Phillips, Wm. L.....Buffalo, N. Y.
Porter, John.....McKeesport, Pa.
Posey, William C.....Philadelphia, Pa.
Pyle, Walter L.....Philadelphia, Pa.
Ralston, Wallace.....Houston, Texas
*Ray J. M.....Louisville, Ky.
Reese, Warren S.....Scranton, Pa.
Ricker, Wm. G.....St. Johnsbury, Vt.
Rood, Luther C.....Boston, Mass.
Scarlett, Hunter.....Philadelphia, Pa.
Schlindwein, G. W.....Erie, Pa.
Schweinitz, G. E. de.....Philadelphia, Pa.
Shastid, T. H.....Superior, Wis.
Sherman, Elbert S.....Newark, N. J.
Simpson, W. L.....Memphis, Tenn.
Smith, George B.....Rome, Ga.
Smith, Richard C.....Superior, Wis.
Snell, Albert C.....Rochester, N. Y.
Stanford J. B.....Memphis, Tenn.
Starr, Elmer G.....Buffalo, N. Y.
Stegman, L. E. V.....Battle Creek, Mich.
Stieren, Edward.....Pittsburgh, Pa.
Taylor, Lewis H.....Wilkes-Barre, Pa.
Thompson, Geo. H.....North Adams, Mass.
Thompson, Peter H.....Boston, Mass.

Thomson, Edgar S.....New York City
Timberman, Andrew.....Columbus, O.
Vail, Derrick T.....Cincinnati, O.
Veasey, C. A.....Spokane, Wash.
Virden, John E.....New York City
Walter, Will.....Chicago, Ill.
Weed, Harry M. .....Buffalo, N. Y.
Weimer, Edgar S.....Pittsburgh, Pa.
Weisser, E. A.....Pittsburgh, Pa.
Wells, David W.....Boston, Mass.
Wescott, C. D.....Chicago, Ill.
Wiener, Meyer.....St. Louis, Mo.
Wilmer, W. H.....Washington, D. C.
Wolff, Julius.....New York City
Wood, Casey A.....Chicago, Ill.
Woodruff, Thos. A.....New London, Conn.
Yazujian, D. M.....Trenton, N. J.
Zentmayer, Wm.....Philadelphia, Pa.

*Deceased.

NEWS ITEMS

Personals and items of interest should be sent to Dr. Melville Black, 424 Metropolitan Building, Denver, Colorado. They should be sent in by the 25th of the month. The following gentlemen have consented to supply the news from their respective sections: Dr. Edmond E. Blaauw, Buffalo; Dr. H. Alexander Brown, San Francisco; Dr. V. A. Chapman, Milwaukee; Dr. Robert Fagin, Memphis; Dr. M. Feingold, New Orleans; Dr. Wm. F. Hardy, St. Louis; Dr. Geo. F. Keiper, LaFayette, Indiana; Dr. Geo. H. Kress, Los Angeles; Dr. W. H. Lowell, Boston; Dr. Pacheco Luna, Guatemala City, Central America; Dr. Wm. R. Murray, Minneapolis; Dr. G. Oram Ring, Philadelphia; Dr. Chas. P. Small, Chicago; Dr. John E. Virden, New York City; Dr. John O. McReynolds, Dallas, Texas; Dr. Edward F. Parker, Charleston, S. C.; Dr. Joseph C. McCool, Portland, Oregon. Volunters are needed in other localities.

DEATHS.

Dr. J. L. Goux, Detroit, Michigan, died December 1st, aged 48.

Dr. R. L. Randolph, Baltimore, Maryland, died December 9th, aged 59.

Dr. Edgar R. Russell, Asheville, N. C., died November 27th, aged 49.

Dr. George H. Stubbs, Birmingham, Alabama, died November 28th, aged 50.

PERSONALS.

Dr. Vard H. Hulen, of San Francisco, has been visiting in Houston, Texas, for several weeks.

Dr. Mark J. Schoenberg has been appointed adjunct consulting ophthalmologist to the Presbyterian Hospital, New York City.

Beatson Hird and T. Harrison Butler have been elected surgeons to the Birmingham and Midland Hospital.

Dr. Gustavus I. Hogue has been appointed head of the Eye, Ear, Nose and Throat Department of the new Milwaukee County Dispensary.

Dr. George E. de Schweinitz, Professor of Ophthalmology at the University of Pennsylvania, has been making a brief holiday stay in Florida.

Dr. G. Oram Ring of Philadelphia, President of the Philadelphia Medical Club, has been enjoying a holiday fishing jaunt at Port Sewell, Florida.

Dr. Howard Forde Hansell of Philadelphia, Professor of Ophthalmology in the Jefferson Medical College, will spend the brief holiday season at Detroit.

Dr. R. J. Sprowl, lately of Base Hospital Number 34, Nantes, France, A. E. F., has returned to this country and is now associated with Dr. George F. Keiper of Lafayette, Indiana.

Dr. Wm. M. Sweet, Associate Professor of Ophthalmology at Jefferson Medical College, Philadelphia, is spending his Christmas holidays at the Homestead Hotel, Hot Springs, Virginia.

Dr. H. B. Young, of Burlington, Iowa, celebrated the fortieth anniversary of his arrival in Burlington by entertaining his professional colleagues and neighbors, Friday, December 26th, 1919.

Past Assistant Russell W. Raynor, U. S., P. H. S., is making a survey in the trachomatous districts in the State of Missouri. The Trachoma Hospital at Pikeville, Kentucky is in charge of a Surgeon J. Allen Eldridge, during Surgeon Raynor's absence.

Dr. L. Webster Fox of Philadelphia, had as his guests at the University Club, November 22nd, the members of the L. Webster Fox Ophthalmological Club, who saw service overseas. Several of the guests won high honors abroad. Dr. John A. White was one of the first American surgeons to be made a prisoner.

At the November meeting of the Ophthalmic Section of the College of Physicians of Philadelphia, Col. Mosher, of Boston, delivered an address upon "Nasal Drainage in Lacrimal Disease," describing his modification of the West operation. Following the Section meeting a reception and supper in honor of Col. Mosher was given by Dr. George E. de Schweinitz.

SOCIETIES.

The Thirtieth Anniversary of the foundation of the Paris Ophthalmological Society was commemorated on November 16th.

The Utah Ophthalmological Society held its second meeting of the season on November 17th at the residence of Dr. G. B. Pfoutz in Salt Lake City.

At the December meeting of the Chicago Ophthalmological Society some of the more recent developments of Glaucoma were discussed. Twenty-two members met at the informal dinner preceding the meeting, and more than sixty were present.

Plans are under way for a joint meeting, in February, of the Minnesota Academy of Ophthalmology and Oto-Laryngology, the Milwaukee Oto-Ophthalmological Club, the Indiana Academy of Ophthalmology and Oto-Laryngology, the Chicago Oto-Laryngological Society, and the Chicago Ophthalmological Society. The day will be devoted to clinics, and the meeting will be held in the evening.

On this date the Pittsburgh Ophthalmological Society held its initial meeting since the opening of the recent war.

The following officers were elected to serve for the current year:

President, Edward B. Heckel.

Vice-President and Treasurer, Edward Stieren.

Secretary, Adolph Krebs.

Reporter, Hunter H. Turner.

MISCELLANEOUS.

Among a population of 16,000,000 in Mexico, there are 120,000 blind.

Dr. W. G. E. Flanders, of Burlington, Vt., has patented an arrangement of a disk of lenses, like the Rekoss disk, to be used at the sight-hole of an ear, nose, or throat mirror.

It is learned, through the Illinois Society for the Prevention of Blindness, that sixteen deaths from wood alcohol have occurred in the past three months. Four other victims are in a precarious condition, and if they recover it is probable there will be some permanent impairment of their vision.

Professor F. de Lapersonne, assisted by Professor Terrien, Dr. Velter, Dr. Prelat and Dr. Monbrun, directors of the clinic and laboratory of the Faculty of Medicine of Paris, have begun a graduate course of sixteen lessons in ophthalmology at the Hotel Dieu. Foreign medical men may attend.

Dr. F. Park Lewis, of Buffalo, has been elected a member of the Board of Directors of the National Committee for the Prevention of Blindness. This committee is doing a most excellent work in arousing interest in methods for the prevention of blindness, and in our public schools by the formation of special classes for the visually defective.

At the last session of the Minnesota legislature a bill was passed providing for the establishment of classes for the conservation of vision, by appropriating a sum of $200.00 per annum for each child requiring the special benefit of such classes. Dr. Meyer, of Ohio, has been appointed supervisor of the department, and Dr. Douglas F. Wood Minneapolis, has donated his services for the examination of candidates and treatment of children accepted for conservation of vision classes.—A. M. A. Journal.

OPHTHALMIC LITERATURE

These lists contain the titles of all papers bearing on Ophthalmology received within the preceeding month. These titles are all in English, some of them modified to indicate more clearly their subjects. These subjects are grouped under appropriate heads, the succession of groups being the same from month to month. In the group the papers are arranged alphabetically usually by the name of the author in heavy-face type. After the subject of the paper (Ill.) indicates the number of illustrations. (Pl.) the number of plates, and (Col. pl.) colored plates illustrating the article. (Abst.) shows that it is an abstract of the original article. (Bibl.) tells that the paper is accompanied by an important bibliography. (Dis.) means that a discussion of the subject is published with it. Under Repeated Titles are indicated additional publication of papers already noticed. To secure the earliest possible notice writers may send copies of their papers, or reprints, to 318 Majestic Bldg., Denver, Colorado.

DIAGNOSIS.

Dolman, P. Tests for Determining the Sighting Eye. Amer. Jour. Ophth., v. 2, p. 867.

Scheffer. Sight and Photography through Cloudy Media. Naturwissenschaften, 6, p. 768.

THERAPEUTICS.

Bonnefon, G. Therapeutics in External Eye Diseases. Ann. d'Ocul., v. 156, pp. 577-597.

Darier, A. Parenteral Injections of Cow's Milk. Clin. Opht., v. 23, p. 131. Abst., Brit. Jour. Ophth., v. 3, p. 567.

Hori, S. Pyoktanin in Ophthalmology. Japan Med. World, Nov. 2, 1919, No. 307. Abst., Jour. Amer. Med. Assn., Dec. 13, 1919, v. 73, p. 1856.

Iredell, C. E., and **Ryley, C. M.** Diathermy in Ocular Diseases. Proc. Roy. Soc. Med., 1918-19. Sec. on Electro-Therap., 31-33.

Repeated Titles. **Chevalier** (v. 2, p. 626), Brit. Jour. Ophth., v. 3, p. 569. **Gaupillat** (v. 2, p. 371), Brit. Jour. Ophth., v. 3, p. 566.

OPERATIONS.

Frias Onate, A. Cocain in Ophthalmology and Oto-Laryngology. Rev. Cubana de Oftalm., v. 1, p. 613.

REFRACTION.

Bailey, J. H. Inverse Astigmatism and Asthenopia. Amer. Jour. Ophth., v. 2, p. 892.

Chacon, A. Astigmatism of the Oblique Rays and Refraction. (1 ill.) An. Soc. Oft. Mexicana. Nov., 1919, p. 207. Rev. Cubana Oftalm., v. 1, pp. 548-552.

Davis, A. E. Accommodation in the Lensless Eye. Amer. Jour. Ophth., v. 2, p. and p. 881.

Dunn, P. Notation of Axes of Cylinders. Brit. Jour. Ophth., v. 3, p. 575.

Gerard, M. G. Acute Poisoning from Two Drops of Duboisin. Ann. d'Ocul., v. 156, p. 637.

Gould, G. M. Personal, Artistic and Public Tragedies of an Artist's Eyestrain. American Medicine, Nov., 1919, p. 725.

Katz, J. Relation of Eye and Ear Disturbances to Disorders of Gastroenteric Tract. Med. Rec., 96, p. 727.

Koegel, H. Pupillary Distance and Other Dimensions. Zeitschr. f. ophth. Optik, 1916, pp. 33-65, and 129.

Lang, T. B. Standard Notation of Cylinder Axes. Brit. Jour. Ophth., v. 3, p. 576.

Mendoza, R. Theory of Skiametry. Rev. Cubana de Oftalm., v. 1, p. 598.

Veasey, C. A. Paralysis of Accommodation Due to Focal Infections. Amer. Jour. Ophth., v. 2, p. 858.

OCULAR MOVEMENTS.

Bourland. Total Paralysis of Third Pair in Right Eye. Ann. d'Ocul., v. 156, pp. 616-620.

Carreras, B. Mnemonics for Addition or Subtraction of the Angle Alpha in Strabismus. Arch. de Oftal. Hisp.-Amer., v. 19, pp. 622-627.

Howard, H. J. A Six Meter Stereoscope. (2 ill.) Amer. Jour. Opht., v. 2, p. 849.

Lafon, C. Nystagmus and Nodding Spasm. Jour. de Méd. de Bordeaux, v. 90, p. 404. Abst., Jour. Amer. Med. Assn., v. 73, p. 1729.

Lapersonne, F. de and **Prélat.** Extrinsic Ophthalmoplegia in Basedow's Disease. Soc. d'Opht. de Paris, Oct. 11, 1919. Ann. d'Ocul., v. 156, p. 620.

Leventhal, J. H. Homonymous Diplopia. Optic Jour. and Rev. of Optom., v. 44, p. 163.

Liddell, H. S. Eye Movements and Attention. Amer. Jour. Psychol., v. 30, p. 241.

Lidwell, M. C. Ocular Vertigo. Med. Jour. Australia, October 18, 1919, p. 328.

Pelfort, C. Weber's Syndrome in Boy Aged 4. Revista Med. del Uruguay, v. 22, p. 163. Abst., Jour. Amer. Med. Assn., v. 73, p. 1734.

Prince, A. L. Compensation of Ocular and Equilibrium Disturbances which Follow Removal of the Labyrinth. Amer. Jour. Phys., v. 49, p. 130.

Ruiz, J. M. Operation for Advancement of External Rectus Muscle. (3 ill.) Rev. Cubana de Oftalm., v. 1, pp. 573-578.

Woods, H. Interpretation of Muscular Imbalance. Jour. Amer. Med. Assn., v. 73, p. 1784.

CONJUNCTIVA.

Buley, E. C. Xerophthalmia Among Rats. Biochemical Jour., July, 1919. Abst., Med. Jour. Australia, Oct. 11, 1919, p. 315.

Cirincione, G. Trachoma in the Army. Gazz. Med. lomb. Milan, 78, pp. 9-11.

Finlay, C. E. Varieties of Trachoma and Modes of Treatment. Revista Cubana de Oftal., v. 1, p. 619.

Guiral, R. Blennorrhagic Ophthalmia Neonatorum. Los Progress de la Clin., Sept., 1919, p. 121.

Santos Fernandez, J. Stubborn Conjunctivitis. Rev. Cubana de Oftal., v. 1, p. 533.

Scolari, E. Prophylaxis of Trachoma. Gazz. de Osp. Milan, v. 40, p. 59.

Wieden, E. Treatment of Trachoma. Rev. Cubana de Oftalm., v. 1, pp. 578-584.

Repeated Titles. **Sculco** (v. 2, p. 372), Brit. Jour. Ophth., v. 3, p. 564.

CORNEA AND SCLERA.

Fernandez, F. M. Herpes of Cornea after Antityphoid Vaccination. Rev. Cubana de Oftalm., v. 1, p. 592.

Guiral, R. Treatment of Keratomalacia. Rev. Cubana de Oftalm., v. 1, p. 610.

Hiwatari, K. Histology of Cornea-Scleral Margin. Acta Scholae Med. Univ. Imp. in Kioto, v. 3, 1919, pp. 277-286.

Key, B. W. Antidiphtheritic Serum with Special Reference to Hypopyon Keratitis (Bibl.) Arch. of Ophth., v. 48, pp. 581-613.

Lottrup-Andersen. Parenchymatous Keratitis with Cross-barred Marking. Hosp. Tid., v. 62, p. 569.

Löwenstein. Operation for Staphyloma of Cornea. Deutsch. med. Woch., v. 45, p. 480.

Menacho, M. Primary Circumscribed Abscess of Sclerotic. (4 ill.) Arch. de Oftal. Hisp. Amer., v. 19, pp. 605-616.

Potts, G. Keratitis Following Explosion of Powder. Roy. Soc. Med. Sec. on Ophth., Dec. 3rd, 1919; Lancet, Dec. 13, 1919, p. 1084.

Small, C. P. Acriflavin as a Stain for Corneal Ulcers. Amer. Jour. Ophth., v. 2, p. 892.

Wise, W. D. Fragilitis Ossium with Blue Sclerotics. Jour. Amer. Med. Assn., v. 73, p. 1696.

ANTERIOR CHAMBER AND PUPIL.

Stevenson, E. Mobile Cyst of Iris. Brit. Jour. Ophth., v. 3, p. 555.

UVEAL TRACT.

Cohn, P. Hetol in Chorio-Retinitis Tuberculosa. Münch. med. Woch., v. 65, p. 1438.

Dianoux. Aspirin in Syphilitic Iritis. Clin. Opht., v. 23, p. 147. Brit. Jour. Ophth., v. 3, p. 567.

Mas Soewarno. Forms of Iris Depigmentation. Amer. Jour. Ophth., v. 2, p. 884.

Thomsen, H. Uveo-Parotidea Treated with Tuberculin. Ugeskrift for Laeger, v. 81, p. 1517.

SYMPATHETIC DISEASE.

Arruga. Treatment of Sympathetic Ophthalmia by Salvarsan. España Oftal., August, 1919. Brit. Jour. Ophth., v. 3, p. 569.

Santos Fernandez, J. Exaggerated Fear of Sympathetic Ophthalmia. Gaceta Med. de Mexico, September, 1919, p. 204.

Sympathetic Ophthalmia. Med. Record, October 18, 1919, v. 96, p. 671.

Zentmayer, W. Present Views Concerning Sympathetic Ophthalmia. (Dis.) Pennsylvania Med. Jour., v. 23, pp. 55-58.

GLAUCOMA.

Santos Fernandez, J. Iridectomy the Ideal Treatment in Glaucoma. Rev. Cubana de Oftal., v. 1, p. 503.

CRYSTALLINE LENS.

Benedict, W. L. Intracapsular Extraction of Cataract. Minnesota Med., v. 2, p. 461.

Bennett, A. G. Immediate Capsulotomy in Extraction of Cataract. Amer. Jour. Ophth., v. 2, p. 854.

Lane, F. Persistent Posterior Fibrovascular Sheath of Lens. (15 ill., Bibl.) Arch. of Ophth., v. 48, pp. 573-580.

Lister, A. E. J. Assistants in Smith's Cataract Operation. Amer. Jour. Ophth., v. 2, p. 865.

Portillo, J. W. Barraquer's Extraction of Cataract. Rev. Cubana de Oftalm., v. 1, p. 616.

Poulard. Cataract Following War Wounds. Soc. d'Opht. de Paris, Oct. 11, 1919. Ann. d'Ocul., v. 156, p. 621.

Salterain, J. de. Congenital Cataract. Rev. Med. del Uruguay, 22, p. 523. Abst., Jour. Amer. Med. Assn., v. 73, p. 1401.

Santos Fernandez, J. The Operation for Cataract in Children. Revista Cubana de Oftal., v. 1, p. 513.

Wells, D. W. Natural History of Cataract. Amer. Jour. Ophth., v. 2, p. 893.

VITREOUS.

Hijikata, Y. Formation of Lactic Acid in Vitreous. Acta Scholae Medicinalis Univ. Imperialis in Kioto., v. 3, pp. 207-212.

RETINA.

Arey, L. B. Retinal Mechanism of Efficient Vision. Jour. Comp. Neurol., v. 30, p. 343.

Bell, L. Visibility of Bright Lines. Science, October 3, 1919, p. 331.

Birch-Hirschfeld. Origin and Treatment of Retinal Detachment. Med. Klin., v. 15, p. 200.

Doesschate, G. ten. Position of the Yellow Spot in Relation to the Optic Nerve. Nederl. Tijdschr. v. Geneesk., v. 2, September 27, 1919, p. 906. Abst., Jour. Amer. Med. Assn., v. 73, p. 1968.

Gonzalez, J. Hemorrhages of the Retina in Influenza. Med. Ibera, October 11, 1919, v. 9, p. 19. Abst., Jour. Amer. Med. Assn., v. 73, p. 1908.

Potts, G. Detachment of Retina and Unusual Condition of Conjunctiva. Roy. Soc. Med., Sec. on Ophth., Dec. 3rd, 1919. Lancet, Dec. 13, 1919, p. 1084.

Riedel, H. H. Photoelectric Reaction in the Human Eye. Zeitschr. f. Biol., Münch. u. Berlin, v. 69, p. 125.

Senet, R. Image on Retina Not Inverted. Rev. de la Univ. de Buenos Aires, v. 41, p. 398. Abst., Jour. Amer. Med. Assn., v. 73, p. 1909.

TOXIC AMBLYOPIAS.

Blegvad, O. Central Amblyopia from Denatured Alcohol. Hosp.-Tid., v. 62, p. 564.

OPTIC NERVE.

Welton, C. B. Optic Neuritis and Diseased Tonsils. Ill. Med. Jour., v. 26, pp. 305-311.

VISUAL TRACTS AND CENTERS.

Best. Center of Vision in Brain. Berl. klin. Woch., v. 46, p. 237.

Bollack. Chiasmal and Ventricular Alterations in Cerebral Tumor. Soc. d'Opht. de Paris, Oct., 1919. Ann. d'Ocul., v. 156, p. 621.

Fradkine, S. Narrowing of the Visual Fields Not Hysteric. Clin. Opht., v. 23, p. 157.

Guillain, G. Hemorrhagic Meningitis after Occipital Fracture and Complete Blindness with Recovery. Progres Med., v. 34, p. 182.

Neurobiotaxis. New York Med. Jour., Nov. 15, 1919, p. 815.

Ribon, V. Centers for Optic and Auditory Perception. Rep. de Med. y Cirur., v. 11, p. 10. Abst. Jour. Amer. Med. Assn., v. 73, p. 1908.

COLOR VISION.

Oloff, H. Color Blindness in New Born. Med. Klin., v. 15, p. 233.

EYEBALL.

Cassimatis. Ocular Colobomas. Clin. Opht., v. 23, p. 151.

Van Duyse, G. Research on Cyclopean Microphthalmos. Arch. Méd. Belges, v. 73, p. 625. Abst., Jour. Amer. Med. Assn., v. 73, p. 1963.

Repeated Titles. **Van Duyse** (2 p. 712), Brit. Jour. Ophth., v. 3, p. 529.

LACRIMAL APPARATUS.

Benedict, W. L., and **Barlow, R. A.** Treatment of Chronic Dacryocystitis. (5 ill.) Amer. Jour. Ophth., v. 2, p. 843.

Brownlie, W. B. Infection of Lacrimal Sacs, Antrum, Pharynx and Tonsils from Blastomyces Albicans. Jour. Laryngol., Rhin. and Otol., London, v. 34, p. 425.

Malling, B. Nose a Factor in Disease of Lacrimal Passages. Norsk Mag. for Laegevid., v. 80, p. 1130. Abst., Jour. Amer. Med. Assn., v. 73, p. 1910.

Santos Fernandez, J. Treatment of Chronic Suppurative Dacryocystitis after Urraca. Rev. Cubana de Oftal., v. 1, p. 540.

LIDS.

Barbé, A. The Claude Bernard-Horner Syndrome. Progres Méd., v. 34, p. 447. Abst. Jour. Amer. Med. Assn., v. 73, p. 1966.

Bauer, C. Heteroplasty of Lids after Method of Thiersch. Anales de la Soc. Oftalm. Mexicana, Nov., 1919, p. 213.

Carvalho, J. P. Mutilations of Lids in War Wounds Treated by Snydacker-Morax Autoplasty. (4 ill.) Ann. d'Ocul., v. 156, pp. 597-614.

Duhamel, A. Use of Elasticity of Blood Vessels in Treatment of Ptosis. Ann. d'Ocul., v. 156, p. 615.

Gil, R. Oculopalpebral Prothesis. (5 ill.) Arch. de Oftal. Hisp.-Amer., v. 19, pp. 616-622.

Marquez. Blepharoplasty. Arch. de Oft. Hisp.-Amer., v. 19, p. 631.

ORBIT.

Argañaraz, R., and **Vallé, D.** Exophthalmos from Fracture of Base of Skull. Rev. de la Asoc. Med. Argentina, v. 30, p. 377. Abst., Jour. Amer. Med. Assn., v. 73, p. 1908.

Bazett, H. Exophthalmic Goiter Cured by Inunctions. Practitioner, v. 103, p. 389.

Blohmke. Orbital Phlegmon. Deut. Med. Woch., v. 45, p. 367.

Christie, C. D. Basal Metabolism in Exophthalmic Goiter. Ohio State Med. Jour., v. 15, p. 708.

Hepburn, M. Aneurysmal Varix of Cavernous Sinus. Roy. Soc. Med. Sec. on Ophth., Dec. 3, 1919. Lancet, Dec. 13, 1919, p. 1084.

Liégard. Double Exophthalmos with Aneurysm. Soc. d'Opht. de Paris, Oct., 1919. Ann. d'Ocul., v. 156, p. 621.

Means, J. H., and **Aub, J. C.** Basal Metabolism in Exophthalmic Goiter. Arch. Internal. Med., v. 24, pp. 645-678.

Nordenson, J. W. Position of the Side Walls of the Human Orbit at Different Ages. Acta Chirurg. Scandin., v. 52, p. 45. Abst., Jour. Amer. Med. Assn., v. 73, p. 1563.

Rennie, G. E. Exophthalmic Goiter and Myasthenia Gravis. Med. Jour. Australia, November 15, 1919, pp. 4-6.

PARASITES.

James, R. R., and **Hunt, E. L.** Subconjunctival Filaria Loa. Lancet, November 15, 1919, p. 874.

Oesterreicher, L. Subretinal Cysticercus. Med. Klin., 1919, v. 15, p. 360.

Tyrrell, E. J. Filaria Loa in Lid. Lancet, November 22, 1919, p. 496.

TUMORS.

Bell, G. H., and **Toussy, S.** Non-Operable Tumor of Orbit and Brow Treated with Radium. (3 ill., Bibl.) Arch. of Ophth., v. 48, pp. 531-535. Amer. Jour. Ophth., v. 2, p. 874.

Charles, J. W. Positive Focal Tuberculin Reaction in Spindle-cell Sarcoma. Arch. of Ophth., v. 48, pp. 569-571. Amer. Jour. Ophth., v. 2, p. 875.

Knapp, A. Subretinal Exudate Simulating Sarcoma of Choroid with Anatomic Examination. (1 pl.) Arch. of Ophth., v. 48, pp. 559-562. Amer. Jour. Ophth., v. 2, p. 873.

Lapersonne, F. de, and Degrais. Treatment of Tumors of Eyelids by Radium. Arch. d'Opht., May-June, 1919. Brit. Jour. Ophth., v. 3, p. 569.

Rosseau, R. Cyst of the Orbit. Arch. Méd. d'Angers, 22, p. 86.

Roy, D. Epithelioma of Eyeball and Lids; Operation; No Return. Arch. of Ophth., v. 48, pp. 563-567. Amer. Jour. Ophth., v. 2, p. 876.

INJURIES.

Burns of the Eye by Lime. Jour. Amer. Med. Assn., v. 73, p. 1769.

Hill, W. W. Injuries of the Cornea. Jour. Tenn. St. Med. Assn., v. 12, p. 248.

Hogue, G. I. Eye Surgery in the War. Wisconsin Med. Jour., v. 18, pp. 248-252.

Lagrange, F. Wounds of the Eye. Bull. de l'Academie de Méd., v. 82, p. 292. Abst., Jour. Amer. Med. Assn., v. 73, p. 1964.

Martin, A., and Watkins, W. W. Foreign Body Injuries to Eyes. Localization and Removal. Southwestern Med., v. 3, pp. 1-18.

Maxey, E. E. Ophthalmic War Injuries. Northwest Med., v. 18, p. 232.

Oliver. Gunshot Wound of Eye. Roy. Soc. Med., Sec. on Ophth., Dec. 3, 1919. Lancet, December 13, 1919, p. 1084.

Percival, A. S. Injuries to Trochlea. Brit. Jour. Ophth., v. 3, pp. 554-555.

GENERAL DISEASES.

Brav, A. Syphilitic Ocular Diseases. New York Med. Jour., v. 110, pp. 889-891.

Calhoun, F. P. Ocular Complications due to Typhoid Inoculation. (Bibl.) Arch. of Ophth., v. 48, pp. 553-558.

Crookshank, F. G. Epidemic Encephalitis and Influenza. Med. Press, v. 108, pp. 405, and 423.

Evans, J. J. Relation of Dental to Ocular Disease. Birmingham Med. Rev., v. 83, p. 1.

Gonzalez-Alvarez, M. Cerebral Tuberculoma with Ocular Symptoms. Pediatria Espan., v. 8, p. 80.

Gonzalez, J. de J. Ocular Symptoms in Hemicrania. Rev. Cubana de Oft., v. 1, pp. 553-569.

Harry, P. A. Acute Anterior Ethmoiditis in Young Subjects. Brit. Jour. Ophth., v. 3, p. 557.

Hershberg, H. Lethargic Encephalitis. New York Med. Jour., v. 110, p. 899.

Kearney, J. A. Eye Manifestations of Syphilis. Urologic and Cutaneous Rev., December, 1919, p. 683.

Lapersonne, F. de. Infectious Complications in Actinomycosis. Soc. d'Opht. de Paris, October 11, 1919. Ann. d'Ocul., v. 156, p. 620.

Ribon, V. Intimate Relation between Eye and Ear. Rev. Cubana de Oftal., v. 1, pp. 584-592.

Skversky, A. Lethargic Encephalitis in the A. E. F. Amer. Jour. Med. Sc., v. 158, p. 849.

Stenger. Endonasal Treatment of Ocular Disease. Deutsche. med. Woch., v. 45, p. 253.

Tanaka, K. Lethargic Encephalitis in Japan. Japan Med. World, October, 1919, No. 305.

Woods, H. Lethargic Encephalitis. (Bibl.) Arch. of Ophth., v. 48, pp. 536-552. Amer. Jour. Opht., v. 2, p. 869.

HYGIENE.

Artificial Daylight. Brit. Med. Jour., November 29th, 1919, p. 720.

Berry, G. L. Saving Sight in the Industries Med. Rev. of Rev., v. 25, p. 652.

Harman, N. B. School Myopia. Brit. Med. Jour., October 4, 1919, p. 451.

McDonnell, W. C. School Myopia. Brit. Med. Jour., November 1, 1919, p. 578.

Meade, J. N., and Wilson, J. W. School Myopia. Brit. Med. Jour., Nov. 8, p. 616.

Santos Fernandez, J. Prophylaxis of Ocular Disease in School Children. Rev. Cubana de Oftal., v. 1, p. 525.

Würdemann, H. V. Optical Aspects of Printing Magazines from Typewriter Copy. Amer. Jour. Ophth., v. 2, p. 888.

OPHTHALMIC SOCIOLOGY.

Batten, R. D. Ophthalmic Physicians and Advancement of Ophthalmology. (Dis.) Lancet, November 29th, 1919, pp. 962-964. December 13, pp. 1084 and 1093.

Doesschate, G. ten. Defects of Visual Fields in Flying Officers. Zeitschr. f. Augenh., January-February, 1918. Abst., Brit. Jour. Ophth., v. 3, p. 571.

Failure to Provide Spectacles Treated as Parental Neglect. Lancet, December 6, 1919, p. 1058.

Jackson, E. The Congress of Ophthalmology. Amer. Jour. Ophth., v. 2, p. 889.

O'Brien, J. A. Registration of Opticians in Australia. (Dis.) Med. Jour. of Australia, October 11, 1919, p. 320.

Odeneal, T. H. Relationship between General Practitioner and Ophthalmologist. Jour. Med. Soc. N. Jersey, v. 16, p. 427.

Welfare of the Blind. Jour. Amer. Med. Assn., v. 73, p. 1784.

Welfare of the Blind. Brit. Med. Jour., Nov. 29, 1919, p. 718.

EDUCATION, HISTORY AND BIOGRAPHY.

Espino, J. M. Historic Data Concerning Ophthalmology in Venezuela. Rev. Cubana de Oftalm., v. 1, p. 607.

Further Report on Higher Qualifications in Ophthalmology. Brit. Jour. Ophth., v. 3, p. 558, and Lancet, December 6, 1919, p. 1046.

Hirschberg, J. Ophthalmology of Demosthenes. Arch. für Geschichte der Med. Bd., 11, p. 183.

Rohr, v. M. Ernest Abbe and Optics. Naturwissenschaft, v. 6, p. 317.

Silvero, J. E. L. Francisco M. Fernandez and Bibliography of Literature. Revista Med. Cubana, June, 1919.